IC 2018 EECC

PROGRAM BOOK

3rd International Conference on Electrical, Electronic, Communication and Control Engineering (ICEECC 2018)

KSL Hotel, Johor Bahru, Malaysia | 28th-29th November 2018

UTM
UNIVERSITI TEKNOLOGI MALAYSIA

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ABEX

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CONTENTS

Welcome to ICEECC 2018

I would like to express my heartiest congratulation to the organising committee of this 3rd **International Conference in Electrical Electronic Control and Communication 2018 or ICEECC 2018**, who has worked hard to organize and to ensure this conference will be a success. It is my pleasure and great honour indeed to welcome all the participants to this conference.

This conference represents an important part of our commitment to provide a platform for ICEECC members and participants to maintain an active networking and productive collaborative alliances in future. It is our hope, and I am sure it is yours as well, that this ICEECC 2018 will bring us opportunities to share and to start a good professional relationship and networking, as well as possible research collaboration amongst us and our institutions in the coming years. I also hope that this conference will continue to be held annually to ensure continuity in the endeavor for excellence for all the ICEECC participants, the sponsors and all the collaborators involved.

I am looking forward to see you and we will be delighted to have you at the conference, and I sincerely hope that you will find the conference both valuable and enjoyable.

Regards,

Prof. Ir. Dr. Mohd Wazir Bin Mustafa
Chair
School of Electrical Engineering
Faculty of Engineering, UTM

Welcome to ICEECC 2018

On behalf of the organizing committee, it is my great pleasure to welcome all participants from around the globe to attend the 2018 International Conference on Electrical Electronics Communication and Control Engineering (ICEECC 2018).

The main objective of this conference is to provide an international platform for researchers, engineers, academicians as well as industrial professionals from all over the world to share the findings from latest research and developments in Electrical Engineering subject area, which covers control and instrumentation, communication, electronics and power engineering. It is also hope that this conference would create diverse opportunities in networking as well as knowledge and ideas sharing for future collaborations. A total of 229 papers have been submitted to this conference. Only 170 papers are accepted for oral presentation after the reviewing process, which contribute to 75% acceptance rate.

I would also like to express my sincere thanks to our keynote speakers, Assoc. Prof. Dr. Haruichi Kanaya from Kyushu University, Prof. Dr. Zainal Salam from Universiti Teknologi Malaysia, Assoc. Prof. Dr. Hiroaki Morino from Shibaura Institute of Technology, and Prof. Dr. Toshiyo Tamura from Waseda Unversity. Also thanks to the authors and attendees for their technical contributions to ICEECC 2018, the sponsors, the supporters, the exhibitors, the committee members and the secretariats of our conference. Finally, I wish you will completely enjoy the conference and your stay in Johor Bahru.

Professor Dr Mohamad Kamal A Rahim
General Chair
ICEECC 2018

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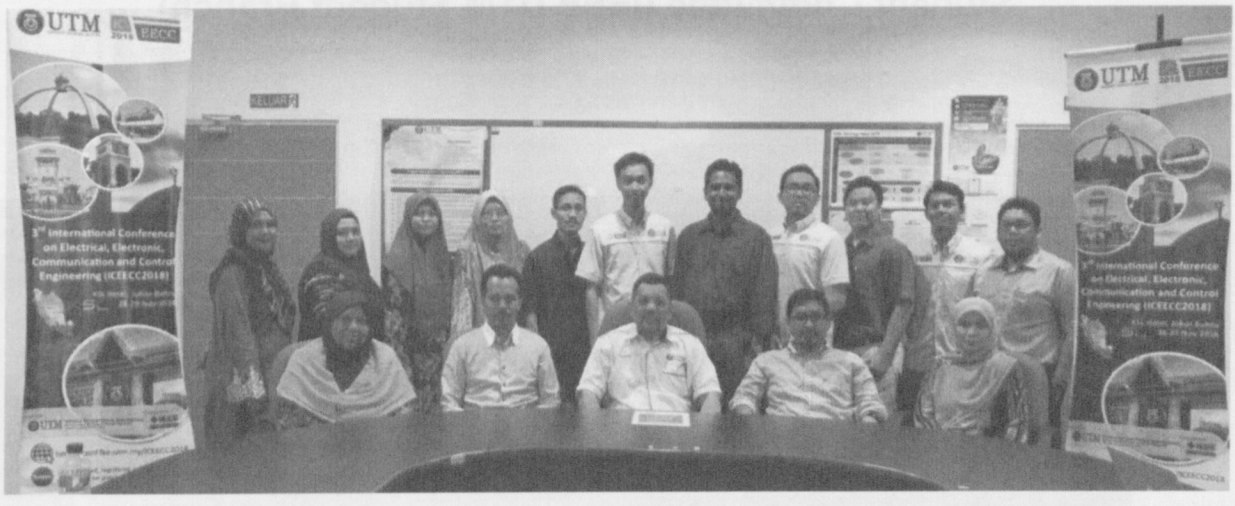

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Keynote Speakers

Keynote 1:
Wireless Energy Harvesting circuit for IOT

Haruichi Kanaya

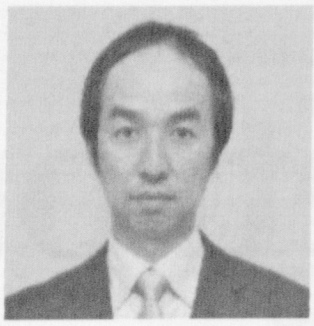
Graduate School of Information Science and Electrical Engineering, Kyushu University, JAPAN

Keynote 2:
Solar Photovoltaic: Prospects and Challenges

Zainal Salam

Centre of Electrical Energy Systems
Faculty of Electrical Engineering
Universiti Teknologi Malaysia

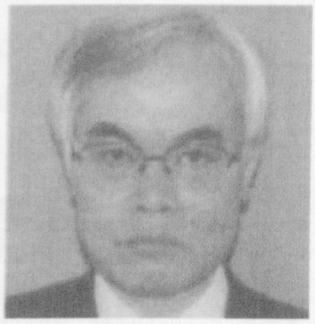
Keynote 3:
Autonomous Vehicular Communication and Control for Smart City



Hiroaki Morino

Shibaura Institute of Technology
Japan

Keynote 4
Connected healthcare monitoring



Toshiyo Tamura

Future Robotic's Organization
Waseda University
Tokyo, Japan

TENTATIVE PROGRAM

ICEECC 2018 PROGRAM AT A GLANCE							
Wednesday, 28 November 2018							
	Ballroom 2, Level 7 KSL Johor Bahru						
0800 - 0900	Registration						
0900 - 0930	Welcoming Speech/Opening						
0930 - 1015	**Keynote 1** *Wireless Energy Harvesting circuit for IOT* **Speaker** *Haruichi Kanaya* *Graduate School of Information Science and Electrical Engineering,* *Kyushu University, Japan*						
1015 -1045	**Morning Break**						
1045 - 1130	**Keynote 2** *Solar Photovoltaic: Prospects and Challenges* **Speaker** *Zainal Salam* *Centre of Electrical Energy Systems* *Faculty of Electrical Engineering, Universiti Teknologi Malaysia*						
1130 - 1215	**Keynote 3** *Autonomous Vehicular Communication and Control for Smart City* **Speaker** *Hiroaki Morino* *Shibaura Institute of Technology, Japan*						
1215 - 1300	**Keynote 4** *Connected healthcare monitoring* **Speaker** *Toshiyo Tamura* *Future Robotics Organization* *Waseda University, Tokyo, Japan*						
1300 -1400	**Lunch**						
	Room 1	**Room 2**	**Room 3**	**Room 4**	**Room 5**	**Room 6**	**Room 7**
1400 - 1540	**CE 1**	**CE 2**	**CE 3**	**EPE1**	**ECE1**	**ECE2**	**CME1**
1540 - 1600	**Afternoon Break**						
1600 - 1720	**CE 1**	**CE 3**	**CE 3**	**EPE 1**	**ECE1**	**ECE2**	**CME1**
1930 - 2330	**Dinner**						

Thursday, 29 November 2018

	Hall, Level 7, KSL Johor Bahru						
0800 - 0900	Registration						
	Room 1	**Room 2**	**Room 3**	**Room 4**	**Room 5**	**Room 6**	**Room 7**
0900 - 1040	**CE 4**	**CE 5**	**EPE2**	**EPE3**	**ECE3**	**ECE4**	**CME2**
1040 - 1100	**Morning Break**						
1100 - 1240	**CE 4**	**CE 5**	**EPE2**	**EPE3**	**ECE3**	**ECE4**	**CME2**
1240 - 1400	**Lunch**						
	Room 1	**Room 2**	**Room 3**	**Room 4**	**Room 5**	**Room 6**	**Room 7**
1400 - 1540	**CE 6**	**CE 7**	**EPE4**	**EPE5**	**CE8**	**CME3**	**CME4**
1540 - 1600	**Afternoon Break**						
1600 - 1720	**CE 6**	**CE 7**	**EPE4**	**EPE5**	**CE8**	**CME3**	**CME4**

Wednesday, November 28

Wednesday, November 28 8:00 - 9:00

Registration

Room: Ballroom 2, KSL

Wednesday, November 28 9:00 - 9:30

Welcoming Speech/Opening

Room: Ballroom 2, KSL

Wednesday, November 28 9:30 - 10:15

Keynote 1

Wireless Energy Harvesting circuit for IOT
Haruichi Kanaya (Kyushu University, Japan)
Room: Ballroom 2, KSL

Wednesday, November 28 10:15 - 10:45

Morning Break

Wednesday, November 28 10:45 - 11:30

Keynote 2

Solar Photovoltaic: Prospects and Challenges
Zainal Salam (University Teknologi Malaysia)
Room: Ballroom 2, KSL

Wednesday, November 28 11:30 - 12:15

Keynote 3

Autonomous Vehicular Communication and Control for Smart City
Hiroaki Morino (Shibaura Institute of Technology Japan)
Room: Ballroom 2, KSL

Wednesday, November 28 12:15 - 13:00

Keynote 4

Connected healthcare monitoring
Toshiyo Tamura (Waseda University Tokyo, Japan)
Room: Ballroom 2, KSL

Wednesday, November 28 13:00 - 14:00

Lunch Break

Wednesday, November 28 14:00 - 15:40

CE 1

Communication Engineering 1
Room: Room1

14:00 *Full-Duplex User-Centric Communication in Two Base Station Systems Using Non-Orthogonal Multiple Access*
Sock Theng Ooi (National Space Agency, Malaysia); Marwan H. Azmi and Razali Ngah (Universiti Teknologi Malaysia, Malaysia)
This paper proposes an improved user-centric Non-Orthogonal Multiple Access (NOMA) communication in two-base station networks with in-band full duplex (IBFD) user. We derive the achievable rates of the proposed user-centric NOMA systems. For benchmarking purposes, we also derive the achievable rate for the user-centric system deploying conventional NOMA schemes, Orthogonal Multiple Access (OMA) schemes and point-point communication systems. We then analyze and simulate the performance of the proposed and all the benchmarked systems. We found that our proposed user-centric NOMA approach has a 64% improvement in the total achievable rate when compared to the benchmarked approach under similar power constraint.

14:20 *Performance Evaluation of Software Defined Network Architecture*
Eberechukwu Numan Paulson and Kamaludin Mohamad Yusof (Universiti Teknologi Malaysia, Malaysia); Elizabeth Onwuka (Federal University of Technology Minna, Nigeria); Sharifah Kamilah Syed Yusof and Muhammad Nadzir Marsono(Universiti Teknologi Malaysia, Malaysia)
Today's traditional networking devices are pre-programmed with different multifaceted rules to perform dedicated tasks. Moreover, their operations cannot be altered in real-time, to perform the devoted tasks. The architectural design of the traditional network makes it unfit

for the next generation of networks. Next generation of networks are required to be elastic, scalable, consistent, secure, end-to-end network connectivity, dynamic QoS guarantee and many more. To address these demands, an emerging technology, known as software-defined networking (SDN), is proposed. SDN architecture separates the control from the hardware devices. SDN is an OpenFlow based technology that is capable of monitoring numerous hardware or software switches from a single control unit. This paper, by using simulation experiments to compare the latency of SDN against the traditional network, demonstrates that SDN is a networking solution for the future. A custom topology was designed using Mininet, a prototype SDN emulator. Results show that the minimum and average latency of the packets in SDN is over 300% less than that for the traditional networks which also implies a comparatively high throughput.

14:40 *Signal Modulation Techniques in Non-orthogonal Waveform for Future Wireless Communication System*

Siti Rosmaniza Ab Rashid (Universiti Teknikal Malaysia Melaka, Malaysia); Norulhusna Ahmad and Sharifah K. Syed-Yusof (Universiti Teknologi Malaysia, Malaysia)

In the future generation of the wireless communication system, the utilization of bandwidth needs to be managed efficiently. Due to that, research on enhancing the efficiency of the bandwidth has recently attracted numerous interests focusing more on the non-orthogonal waveform generation and detection. Even though non-orthogonal waveform is promising a higher efficiency, it introduces inter-carrier interference (ICI) at the transmitter due to the subcarrier overlapping. In this paper, the signaling technique for non-orthogonal waveform generation and detection is discussed. This paper also proposed the use of accumulator (ACC) to improve the system performance of the signal modulation in the non-orthogonal waveform for the next generation of the wireless communication system. The result is represented in an EXtrinsic Information Transfer (EXIT) chart to show the effects of adding ACC into the non-orthogonal system.

15:00 *A Hybrid Predictive Technique for Lossless Image Compression*

Nur 'Aqilah Nor 'Azman, Samura Ali and Rozeha A. Rashid (Universiti Teknologi Malaysia, Malaysia); Faiz Asraf Saparudin (Universiti Tun Hussein Onn Malaysia, Malaysia); Mohd Adib Sarijari (Universiti Teknologi Malaysia & Delft University of Technology, Malaysia)

The rapid growth of social media and digital networks have given rise to huge amount of image data being accessed and exchanged daily. However, the larger the image size, the longer it takes to transmit and archive. In other words, high quality images require huge amount of transmission bandwidth and storage space. Suitable image compression can help in reducing the image size and improving transmission speed. Lossless image compression is especially crucial in fields such as remote sensing healthcare network, security and military applications as the quality of images needs to be maintained to avoid any errors during analysis or diagnosis. In this paper, a hybrid prediction lossless image compression algorithm is proposed to address these issues. The algorithm is achieved by combining predictive Differential Pulse Code Modulation (DPCM) and Integer Wavelet Transform (IWT). Entropy and compression ratio calculation are used to analyze the performance of the designed coding. The analysis shows that the best hybrid predictive algorithm is the sequence of DPCM-IWT-Huffman which has bits sizes reduced by 36%, 48%, 34% and 13% for tested images of Lena, Cameraman, Pepper and Baboon, respectively.

CE 2

Communication Engineering2
Room: Room2

14:00 *Efficient Peer-to-Peer Data Dissemination with Mobile Ad Hoc Routing Optimization with Taguchi Method in Integrated Optical and Wireless Networks*

Adam Wong Yoon Khang and Jamil Abedalrahim Jamil Alsayaydeh (Universiti Teknikal Malaysia Melaka, Malaysia); Sevia Mahdaliza Idrus (Faculty Of Electrical Engineering & Universiti Teknologi Malaysia, Malaysia); Nadiatulhuda Zulkifli(Universiti Teknologi Malaysia, Malaysia); Mohamed Elshaikh (UniMAP, Malaysia)

The Quality of Service (QoS) resource consumption is always the tricky problem and also the on-going issue in the access network of mobile wireless part because of its dynamic nature of network wireless transmissions. It is very critical for the infrastructure-less wireless mobile ad hoc network that communicate in a peer-to-peer fashion. To resolve the problem, Taguchi method optimization of mobile ad hoc routing (AODVUU) is applied in integrated optical and wireless networks called the adLMMHOWAN. Practically, this technique was carry out using OMNeT++ software by building a simulation based optimization through design of experiment. Its QoS network performance is examined based on packet delivery ratio (PDR) metric and packet loss probabilities (PLP) metric that consider the scenario of variation number of nodes. During the performing stage with random mobile connectivity based on improvement in optimized front-end wireless domain of AODVUU routing, the result is performing better when compared with previous study called the oRia scheme with the improvement of 14.1% PDR and 43.3% PLP in this convergence of heterogeneous optical wireless network.

14:20 Afternoon Break

14:40 *Characteristic Evaluation of 20-Bit Consecutive Codes in High Performance Optical Burst Mode Receiver Configuration*

Azura Hamzah (Universiti Teknologi Malaysia, Malaysia); Sevia Mahdaliza Idrus (Faculty Of Electrical Engineering & Universiti Teknologi Malaysia, Malaysia); Adibah Binti Mazwar (Malaysia-Japan International Institute of Technology (MJIIT) - Universiti Teknologi Malaysia, Malaysia); Atsushi Kanno (National Institute of Information and Communications Technology, Japan); Norliza Mohamed (Universiti Teknologi Malaysia & Razak School of Engineering and Advanced Technology, Malaysia)

Optical burst mode receivers are indispensable components for Passive Optical Network (PON) and Ethernet Optical Access Network (E-OSAN). An optical burst mode receiver with transfer function Gn(jω/ω0) = 1 - Hn(jω/ω0) is proposed, of which better performance is anticipated than that of conventional AC-coupling. Next, an optical burst mode receiver with fast response Gn(jω/ωF) and slow response Gn(jω/ωS), whereby Gn(jω/ωF) switches to Gn(jω/ωS) right after the DC component of the input burst signal converges to 0 is proposed. Then, an automatically switching circuit that switches fast response Gn(jω/ωF) to slow response Gn(jω/ωS) circuits right after the maximum peak value of the output burst Gn(jω/ωF) is 1/2 and the DC components of the input burst converges to 0 is also proposed. This paper presents the experiments on same consecutive codes in burst mode receivers using the proposed automatically switching circuit, with evaluation on its characteristics made through simulation.

15:00 *Liquid Level Sensor Based on Fiber Splitter*

Muhammad Yusof Mohd Noor and Ahmad Sharmi Abdullah (Universiti Teknologi Malaysia, Malaysia); Asrul Izam Azmi (Universiti Teknologi Malaysia & The University of New South Wales, Malaysia); Mohd Haniff Ibrahim, Mohd Rashidi Salimand Norazan Kassim (Universiti Teknologi Malaysia, Malaysia)

A novel simple dual parameters fiber sensor to sense liquid level is presented. The operation principle is based on the relative Fresnel reflective intensity. The sensor consists of a fiber splitter with the configuration of one input to multiple fiber outputs, i.e. 1×4, 1×8, 1×12 and 1×18 arrangements that act as a discrete liquid level. A broadband source (BBS) is used as the light source supply. The total reflected power intensity is measured using a power meter. Experimental results show that the power intensity is decreases as the level of liquid is increased. The sensor has a simple configuration, low cost, and it can be customized for a wide height measurement range spanning from a few centimeters up to a hundred meters.

15:20 *Performance of Dynamic Bandwidth Allocation Based Comprehensive Bandwidth Utilization for XG-PON*

Nur Asfahani Ismail (Universiti Teknologi Malaysia, Malaysia); Sevia Mahdaliza Idrus (Faculty Of Electrical Engineering & Universiti Teknologi Malaysia, Malaysia); Rizwan Aslam Butt (University Technology Malaysia, Malaysia); Farabi Iqbal, Nor Affida M. Zin and Fadila Mohd Atan (Universiti Teknologi Malaysia, Malaysia)

Bandwidth allocation during upstream transmission is crucial to determine the efficiency and performance of a XG-PON. For XG-PON, bandwidth assignment is done based on traffic container (T-CONT) which represents a traffic class as per ITU recommendation. Comprehensive bandwidth utilization (CBU) is a dynamic bandwidth allocation (DBA) scheme that is performed at the OLT in XG-PON to assign bandwidth to ONUs based on the traffic classes supporting quality of service (QoS) as per Service Level Agreement (SLA). In this paper, CATV traffic is used as traffic generator which used for generation of Ethernet frames and results showed expected trend of mean upstream delay for traffic class T2, T3 and T4 as compared to recommended value which is below 1.5ms.

15:40 *Impact of Security Breach on the Upstream Delay Performance of Next Generation Gigabit Passive Optical Networks (XGPON)'s Dynamic Bandwidth Allocation Algorithm*

Fadila Mohd Atan and Nadiatulhuda Zulkifli (Universiti Teknologi Malaysia, Malaysia); Sevia Mahdaliza Idrus (Faculty Of Electrical Engineering & Universiti Teknologi Malaysia, Malaysia); Nor Affida M Zin and Nur Asfahani Ismail (Universiti Teknologi Malaysia, Malaysia)

The next generation passive optical networks (GPON) such as long reach GPON is the future-proof solution to answer the continuous demands for access user bandwidth and network expansion. However, security which is yet to be addressed in GPON needs urgent attention as it will become more critical in the GPON that has much longer distance, denser user population and more network elements. In addition, the longer propagation delay in GPON can also lead to a more complex bandwidth allocation mechanism that is expected to operate in a dynamic manner. Among the highlights of recommendations for future implementation are improvements in the security aspect and the use of dynamic bandwidth allocation (DBA) algorithm that suit the characteristics of long reach GPON. Current PON is exposed to degradation attack, a security breach that can harm how bandwidth fairness mechanism among ONUs work. The attacker basically exploits two features by sending GPON upstream signals out of its given slots and cause other ONUs to experience packet loss; (1) The TCP mechanism that reduces an ONU's requested bandwidth in response to packet loss and (2) DBA's bandwidth assignation that is done in accordance to ONU's requested bandwidth. Thus, this project proposes a secured DBA mechanism for NG-PON2 that could overcome this particular threat. In specific, a detection phase will be included in the DBA mechanism to sense and subsequently mitigate abnormal behaviours among ONUs that are harmful to the goal of DBA i.e. to ensure QoS among ONUs and traffics. At the same time, careful attention is given on the delay parameter as it is a critical parameter that can affect DBA performance in long reach GPON. In this paper, preliminary analysis is shown that reveal how possibility of threats increase with increasing of distance and network elements.

CE 3

Communication Engineering 3
Room 3

14:00 *Planar Patch Array Antenna Design with Rectangular-Shaped Ring Slot and Coaxial Probe Feeding for 5G Technology*

Norhudah Seman, Nur Ilham Aliyaa Ishak and Tien Han Chua (Universiti Teknologi Malaysia, Malaysia)

A patch antenna with rectangular-shaped ring slot that fed by a coaxial probe is proposed in this article as the single element for planar patch array antenna design to meet the requirement of multiple input multiple output (MIMO) in Fifth Generation (5G) technology. Initially, the single antenna element is designed at three different center frequencies of 0.85, 1.9 and 2.6 GHz to cover the mobile operating frequency of 0.8, 0.85, 0.9, 1.8, 2.1 and 2.6 GHz, which considering the proposed 5G spectrum below than 6 GHz. The rectangular-shaped ring slot is introduced to the patch antenna with the partial ground plane to widen the bandwidth performance. The designed single element is then arranged to design planar arrays of 2 x 2. Each of elements in the planar array is fed by a coaxial probe. The designs are utilizing a high-performance substrate, Rogers 6010LM.

14:20 *A 2.45 GHz Semi-Flexible Wearable Antenna for Industrial, Scientific and Medical Band Applications*

Shaharil Mohd Shah, Zuhairiah Zainal Abidin and Fauziahanim Che Seman (Universiti Tun Hussein Onn Malaysia, Malaysia); Shipun Anuar Hamzah (Universiti Tun Hussein Onn Malaysia & Faculty pf Eletrical and Electronic Engineering (FKEE), Malaysia); Norshidah Katiran (Universiti Tun Hussein Onn Malaysia, Malaysia)

In this work, a compact size, wearable microstrip patch antenna is designed, simulated and fabricated for the Industrial, Scientific and Medical (ISM) band applications with the operating frequency at 2.45 GHz. A semi-flexible substrate material which is Rogers Duroid RO3003™ with a relative dielectric constant, ε_r of 3, loss tangent, tan δ of 0.010 and thickness, h of 1.52 mm has been proposed to ensure it can be worn on clothes. The antenna has a low-profile feature with 24 × 28 mm2 in dimension. Investigation of the antenna under bending condition on the approximate human arm size is also performed and analysed to ensure that the wearable antenna is applicable for on-body. The bending investigation shows that the initial resonant frequency of 2.45 GHz is shifted to 2.3 GHz. However, the reflection coefficient 2.45 GHz is still greater than the -10-dB line which implies that the antenna is still functional at that particular frequency. The Specific Absorption Rate (SAR) of the antenna has also been simulated to examine whether the antenna obeys the SAR limits under the FCC and CNIRP guidelines. The SAR values obtained show that the antenna obeys the standard for 1 mW input power. The SAR value for 1g of human tissue is computed at 0.03999 W/kg (FCC standard: 1.6 W/kg) while for 10g is at 0.01936W/kg (CNIRP standard: 2 W/kg).

14:40 *Dual Element MIMO Planar Inverted-F Antenna (PIFA) for 5G Millimeter Wave Application*

Nurul Husna Mohd Rais (Universiti Kuala Lumpur British Malaysian Institute, Malaysia); Zuhanis Mansor (University of Kuala Lumpur British Malaysian Institute (UniKl-BMI), Malaysia); Mohamad Kamal A. Rahim (Universiti Teknologi Malaysia, Malaysia)

This work presents a 28 GHz Dual Element Multiple Input Multiple Output (MIMO) Planar Inverted-F Antenna for millimeter wave 5G mobile terminal. The antenna design employs PIFA design concept as it is a common antenna type use for mobile phone as it provides wide bandwidth and good performance. The antenna design begins with a characterization of the single element PIFA design and then extended to Dual Element MIMO PIFA design. The single element PIFA design is enhanced to MIMO design by extending the ground plane and locate the second PIFA at the other end. Isolation between the antenna elements of the MIMO PIFA is analyzed by varying the gap distance between the antenna elements. The result for Envelope Correlation Coefficient, Diversity Gain and Multiplexing Efficiency is also presented. The simulation computed using Computer Simulation Technology (CST) Microwave Studio software.

15:00 *Microstrip Antenna Design with Partial Ground at Frequencies Above 20 GHz for 5G Telecommunication Systems*

Norhudah Seman (Universiti Teknologi Malaysia, Malaysia); Muhammad Afiq Abdul Aziz (Universiti Teknologi Malayisa, Malaysia); Tien Han Chua (Universiti Teknologi Malaysia, Malaysia)

This article presents the design of a microstrip patch antenna at different frequencies above 20 GHz that intended to be used for Fifth Generation (5G) Telecommunication System. The design of microstrip patch antenna that has a radiating element with a rectangular shape and partial ground plane is proposed. The patch antenna is designed using a Rogers RT5880 substrate with dielectric constant, εr of 2.2. The results of the designed antenna design analyzed in terms of the reflection coefficient, bandwidth, gain, and directivity performance. The proposed patch antennas at design frequencies of 25.875 GHz, 38.75 GHz, 43 GHz, 46.25 GHz, 48.7 GHz, 51.5 GHz, 71 GHz, and 83.5 GHz have a fractional bandwidth, gain and directivity that respectively greater than 10.2 %, 2.159 dB and 2.562 dBi. All the designs and analysis are performed by using the CST Microwave Studio software.

CME 1

Control and Mechatronic Engineering 1
Room 7

14:00 *The Application of Artificial Neural Network for Modelling the Removal of Organic Pollutants, Azo Dyes and Heavy Metal: A Review*

Siti Fatimah (Pabelan Kartosuro Surakarta & Universitas Muhammadiyah Surakarta, Indonesia); Wiharto Wiharto (Universitas Sebelas Maret, Indonesia)

The modeling of pollutant degradation, azo dyes, and heavy metal using Artificial Neural Network (ANN) has been done well. The techniques used to do degradation also vary. The literature review study was conducted to determine the development of the use of ANN modeling from year to year. This will provide an overview of predictive studies from a degradation treatment condition that will produce optimum conditions. This optimum condition will support the data generated from the data experimentally, so that it can reduce the cost and time of the laboratory scale. Some degradation techniques used include separation method, coagulation, Advance Oxidation Process, and chemical oxidation. The algorithmic equations used are ANN-LM, MLP-NN, ANN-BP and GFF-NN. Modeling using ANN is one model that is very potential to continue to be developed.

14:20 *An Improved Co-Clustering Algorithm for the Identification of Cancer Subtypes to Identify Cancer Genes*

Logenthiran Machap (University of Technology Malaysia, Malaysia)

Cancer has been classified as a heterogeneous genetic disease comprising various different subtypes based on gene expression data. Early stages of diagnosis and prognosis for cancer type have become an essential requirement in cancer informatics research because it is helpful for the clinical treatment of patients. Besides this, gene network interaction which is the significant in order to understand the cellular and progressive mechanisms of cancer has been barely considered in current research. Hence, applications of machine learning methods become an important area for researchers to explore in order to categorize cancer genes into high and low risk groups or subtypes. Presently co-clustering is an extensively used data mining technique for analysing gene expression data. This paper presents an improved network assisted co-clustering for the identification of cancer subtypes (iNCIS) where it combines gene network information with gene expression data to obtain co-clusters. The effectiveness of iNCIS was evaluated on large-scale Breast Cancer (BRCA) and Glioblastoma Multiforme (GBM). This weighted co-clustering approach in iNCIS delivers a distinctive result to integrate gene network into the clustering procedure.

14:40 *Constructing Population of Initial University Timetable: Design and Analysis*

Juliana Wahid (Universiti Utara Malaysia & School of Computing, Malaysia); Syariza Abdul-Rahman (Universiti Utara Malaysia & School of Quantitative Sciences, Malaysia); Aniza Din (Universiti Utara Malaysia, Malaysia); Naimah Mohd Hussin(Universiti Teknologi MARA, Malaysia)

The creation of initial solution population is important phase in populationbased metaheuristic approach for solving curriculum-based university course timetabling problem since it can influence the quality of the final timetable. This paper presents population of initial solution construction approach in curriculum based course timetabling problem with the use of graph heuristics to determine the sequential order of courses/lectures to be schedule in the timetable. The graph heuristics were set as single and combination of two heuristics. The courses in curriculum-based university course timetabling problem that was arranged based on the heuristics setting will be iteratively allocated to valid empty slots while satisfying all the hard constraints. If a course unable to be allocated to any slots due to no more valid empty slots, it will be added into the unscheduled courses/lectures record. The unscheduled courses/lectures record will be assigned later to the timetable using several procedures that executed in a sequence. The approaches were tested on the ITC2007 instances and the results were analyzed with some statistical tests to determine the best setting of heuristics in the construction approach. The result shows that the construction approach with combination of largest degree followed by saturation degree heuristic produce the highest number of population of initial solutions. The result from this study can be used in the improvement phase of metaheuristic algorithm that uses population-based approach.

15:00 *Modified Brute Force Algorithm to Solve the Closest Pair of Points Problem Based on Dynamic Warping*

Rhowel Dellosa (Technological Institute of the Philippines-Quezon City, Philippines); Arnel Fajardo (Manuel L. Quezon University, Philippines); Ruji Medina (Technological Institute of Technology, Philippines)

This paper introduced an algorithm to solve the closest pair of points problem in 2D plane based on dynamic warping. The algorithm will compute all the distances between the set of points P (x, y) and a reference point R (i, j), record all the result in a grid and then determine the minimum distance using schematic steps. Results shows that the algorithm of finding the closest pair of points has achieved less number of comparisons in determining the closest pair of points compared with the brute force method of closest pair of points.

15:20 *Radial Basis Function Neural Network for Head Roll Prediction Modelling in a Motion Sickness Study*

Sarah 'Atifah Saruchi and Hatta Ariff (Universiti Teknologi Malaysia, Malaysia); Ibrahim Shapiai (Malaysia-Japan International Institute of Technology (MJIIT), Malaysia); Nurhaffizah Hassan (Universiti Teknologi Malaysia, Malaysia); Nurbaiti Wahid(Universiti Teknologi Malaysia & Universiti Teknologi MARA, Malaysia); Noor Jannah Zakaria (Universiti Teknologi Malaysia, Malaysia); Mohd Azizi Abdul Rahman (Universiti Teknologi Malaysia & Malaysia-Japan International Institute of Technology, Malaysia); Hairi Zamzuri (Malaysia-Japan Institute of Technology, Universiti Teknologi Malaysia, Malaysia)

Motion Sickness (MS) is the result of uneasy feelings that occurs when travelling. In MS mitigation studies, it is necessary to investigate and measure the occupant's Motion Sickness Incidence (MSI) for analysis purposes. One way to mathematically calculate the MSI is by using a 6-DOF Subjective Vertical Conflict (SVC) model. This model utilises the information of the vehicle lateral acceleration and the occupant's head roll angle to determine the MSI. The data of the lateral acceleration can be obtained by using a sensor. However, it is impractical to use a sensor to acquire the occupant's head roll response. Therefore, this study presents the occupant's head roll prediction model by using the Radial Basis Function Neural Network (RBFNN) method to estimate the actual head roll responses. The prediction model is modelled based on the correlation between lateral acceleration and head roll angle during curve driving. Experiments have been conducted to collect real naturalistic data for modelling purposes. The results show that the predicted responses from the model are similar with the real responses from the experiment. In future, it is expected that the prediction model will be useful in measuring the occupant's MSI level by providing the estimated head roll responses.

ECE 1

Electronic and Computer Engineering 1
Room 5

14:00 *Simulated Evaluation of New Switching Based Median Filter for Suppressing SPN and RVIN*

Vorapoj Patanavijit (Assumption University, Thailand); Kornkamol Thakulsukanant (ABAC, Thailand); Wilaiporn Lee (King Mongkut's University of Technology North Bangkok, Thailand)

In the past two decades, the SPN (salt and pepper noise) suppressing method is worldwide interested researches on computer vision and image processing hence many SPN suppressing methods have been proposed. In general, the primary goal of SPN removal method is the suppressing of SPN in digital images thereby one of the recent effective and powerful SPN suppressing methods is a new switching-based median filtering (NSMF), which is innovated for suppressing high density SPN. Consequently, this paper thoroughly examines its efficiency and constrain of a new switching-based median filtering when this NSMF is used for suppressing the contaminated image, which is synthesized by SPN and RVIN (random-value impulsive noise). In these simulations, six well-known images (Lena, Mobile, Pepper, Pentagon, Girl, Resolution) with two impulsive noise classes (SPN and RVIN) are used for measuring the its efficiency and constrain. An evaluation of the efficiency is conducted with many previous suppressed methods in forms of subjective and objective indicators.

14:20 *The Statistical Analysis of Random-Valued Impulse Noise Detection Techniques Based on the Local Image Characteristic: ROAD, ROLD and RORD*

Vorapoj Patanavijit (Assumption University, Thailand); Kornkamol Thakulsukanant (ABAC, Thailand)

Advances in local image statistical analysis have made possible the random-valued impulse noise detection but the current noise detections based on ROAD (Rank-Ordered Absolute Differences), ROLD (Rank-Ordered Logarithmic Differences) and RORD (Rank-Ordered Relative Differences), which are the most three effective and practical detections using the local image statistical characteristic, operates effectively on different noise density and different image statistical characteristic. To address these issues, this paper proposes the comparative analysis on the noise detections based on ROAD, ROLD and RORD. Therefore, the first contribution is the comparative statistical distribution of these three noise detections. By comprehensive experiment at each noise density, the optimized detected threshold is later determined from four benchmark data: Lena, Girl, Pepper and Airplane. Moreover, the maximum detection accuracy for each case is comparatively demonstrated by using the noise detections based on ROAD, ROLD and RORD with the optimized detected threshold.

14:40 *Low Energy HEVC 2D-DCT Architectures for FPGA and ASIC*

Ainy Haziyah Binti Awab (University of Technology Malaysia, Malaysia); Ab Al-Hadi Ab Rahman, Mohd Shahrizal Rusli, Usman Ullah Sheikh and Izam Kamisian (Universiti Teknologi Malaysia, Malaysia); Kam Meng Goh (Tunku Abdul Rahman University College, Malaysia)

This paper presents a comparison of two commonly used architectures in 2-dimensional discrete cosine transform (DCT), the parallel and folded architectures, for FPGA and ASIC implementation. The DCT has been designed for sizes 4x4, 8x8, and 16x16 to illustrate small, medium and large size transforms for HEVC video encoder. The objective is to determine suitable low energy architectures to be used when implementing on ASIC and FPGA. Both of these architectures for all three sizes have been designed using Verilog HDL, including the basic serializer-deserializer input and output. The designs have been synthesized to Siltera 180nm technology for ASIC, while Xilinx Kintex Ultrascale has been used for FPGA implementation. Results show that for large size transform of 16x16, ASIC parallel architecture results in roughly 56% less energy compared to folded architecture. As for FPGAs, folded architecture results in roughly 38% less energy

compared to parallel architecture. Another interesting observation is that ASIC implementation results in roughly 100x less energy compared to FPGAs, mainly due to the relatively high power in FPGAs compared to ASICs.

15:00 *The Analysis of Facial Feature Deformation Using Optical Flow*

Hamimah Ujir, Irwandi Hipiny and Dayang A. Jesmi (Universiti Malaysia Sarawak, Malaysia); Sarah Flora Samson Juan (UNIMAS, Malaysia)

Facial features deformed according to the intended facial expression. Specific facial features are associated with specific facial expression, i.e. happy means the deformation of mouth. This paper presents the study of facial feature deformation for each facial expression by using an optical flow algorithm and segmented into three different regions of interest. The deformation of facial features shows the relation between facial the and facial expression. Based on the experiments, the deformations of eye and mouth are significant in all expressions except happy. For happy expression, cheeks and mouths are the significant regions. This work also suggests that different facial features' intensity varies in the way that they contribute to the recognition of the different facial expression intensity.

ECE 2

Electronic and Computer Engineering 2
Room 6

14:00 *Road Crack Detection Using Adaptive Multi Resolution Thresholding Techniques*

Zuraini Othman (University Teknikal Malaysia Melaka, Malaysia)

Machine vision is very important to ensure the success of intelligent transportation systems; especially for road maintenance. Recent research, on automatic image based road crack detection, replaced manual inspection; which depends completely on specialist knowledge and experience. Here, pre-processing and edge detection becomes important to filter out noise and make edge cracks clearer. Furthermore, edge detection becomes more accurate with the help of the threshold selection method. In this paper, we proposed modification of the Canny edge detection method with the Otsu method, on selecting the two threshold values and analysed the image globally and locally using a multi-resolution level of fixed partitioning method. Next, a statistical measure will be used to select the best threshold generated and a global edge image will be obtained. In the experiments, a road crack image dataset from Crackforest will be used. The results revealed that the proposed method performed better than the conventional Canny edge detection method. The results will show that the maximum value from the local threshold result for 5x5 partitioned image outperforms other partition scales in the proposed method.

14:20 *Road Lane Markers Classification Using Binary Scanning and Slope Countours*

Zamani Md Sani (Universiti Teknikal Malaysia Melaka, Malaysia); Hadhrami Ab Ghani and Rosli Besar (Multimedia University, Malaysia); Azizul Azizan (Universiti Teknologi Malaysia (UTM), Malaysia)

Road markers guide the driver while driving on the road to control the traffic for the safety of the road users. With the booming autonomous car technology, the road markers classification is important in its vision segment to navigate the autonomous car. A new method is proposed in this paper to classify five types of road markers namely dashed, single, double, solid-dashed and dashed-solid which are commonly found in the non-urban area using unique features acquired by scanning the binary image of the road markers. These features include the contours and slopes of the centroids which allow the proposed method to perform the road marker classification within the same video frame period. This proposed binary scanning method has been observed to achieve an accuracy value of at least ~93%, which is higher than the accuracy value achieved by the existing methods.

14:40 *A Novel Approach for Self-tuning Hadoop-Spark Performance Using Machine Learning in Big Data Processing*

Md. Armanur Rahman (Multimedia University, Malaysia); Abid Hossen (Khulna University, Bangladesh); Md. Jakir Hossen (Multimedia University, Malaysia); Venkataseshaiah C (Assoc Prof, Malaysia); Bhuvaneswari Thangavel (Multimedia University, Malaysia); Aziza Sultana (Dhaka International University, Bangladesh)

Apache Spark is a distributed open source platform for data processing that utilizes distributed memory concept in order to process big data competently. The performance of Apache Spark is greatly affected by Spark configuration settings. In term of performance, to get the best output from Spark is still a big challenge because of having many of parameters configuration. At present, the parameters are manually tuned by experimentation which is not effective. It needs complicated interactions with the parameters and takes larger parameter space. Besides, these parameters must be re-tuned for various applications and clusters. In this paper, a novel approach called ASSPM based on Linear Regression (LR) is proposed and developed to effectively tune Spark system parameters. This approach has been implemented on Dell server using 5 different dataset sizes and the performance is compared with that of the default configuration of Spark system. Results show a considerable speedup of performance with ASSPM approach.

15:00 *Historical Document Image Binarization Using Pixel-Wise Classification*

Fauziah Kasmin (Universiti Teknikal Malaysia Melaka, Malaysia)

Binarization of historical documents nowadays is very important as digital archiving has become the best and preferred solution for the retrieval and storage of valuable archives. However, the process becomes more challenging due to the degradation of historical documents. Hence, this paper described a method on binarization of historical documents using the learning concept. Support vector machine (SVM) learning was used as a classifier in this work. After training some images with the help of ground truth images, a model

was developed. Testing images then used the model to segregate each pixel as text or non-text. The grey level and RGB values were chosen as descriptors for a particular pixel and comparisons were made between these two descriptors. The intensities of the local neighbourhood for every pixel were used in the experiment. To compare these descriptors, a standard dataset HDIBCO2014, DIBCO2012 and DIBCO2014 was used in the training and testing phase. The results from the experiment clearly showed that grey level values gave better performance compared to RGB values.

EPE 1

Electric Power Engineering 1
Room 4

14:00 *Fault Detection and Classification in Wind Turbine Using Artificial Neural Network*

Noor Fazliana Fadzail (University Malaysia Perlis, Malaysia); Samila Mat Zali (Universiti Malaysia Perlis, Malaysia)

Wind turbine is one of the renewable energy sources that come the most popular nowdays. Operational and maintenance cost is continuously increase especially in wind generator. Early fault detection is very importance in order to optimize operational and maintenance cost. The goal of this project is to study fault detection and classification for a wind turbine (WT) using artificial neural network (ANN). In this project, a single phase fault was place at 9 MW doubly-fed induction generator (DFIG) WT in MATLAB Simulink. The WT is tested under different condition i.e. normal condition, fault at phase A, B and C. The simulation results were used as an input in ANN model for training process. Then, a new set of data are taken under different conditions as an input for ANN fault classifier. The targets outputs of ANN fault classifier were set as '0' or '1' based on fault condition. The results obtained show that the output of ANN fault classifier follows the target output. In conclusion, the fault detection and classification method of WT using ANN was successfully developed.

14:20 *Modelling and Analysis of a PV/Wind/Diesel Hybrid Stand-Alone Microgrid for Rural Electrification in Nigeria*

Ibim Sofimieari (Univeriti Teknologi Malaysia & University of Port Harcourt, Malaysia)

The scarce electricity supply in Nigeria is a key factor to the low industrial development in a country well-known for having the least electrification in Africa per capita. Presently, Nigeria employs four different kinds of energy such as coal, natural gas, hydro, and oil. Three of the four resources above used for the production of energy in Nigeria is connected with increasing emissions of greenhouse gas: natural gas, oil, and coal, with coal releasing the worst. This paper presents a comparative techno-economic analysis of PV/Wind/Diesel hybrid system for rural electrification in Kaduna state, northern Nigeria. HOMER (Hybrid Optimization Model for Electric Renewable) software tool was used for optimization and modelling of this work. From the performance modelling of each system configuration, simulation results show that the PV/Wind/Diesel system with Battery storage is the most cost-effective system since it recorded considerable cost of energy and reduces CO2 emissions significantly.

14:40 *Study on Footstep Power Generation Using Piezoelectric Tile*

Anis Maisarah (Universiti Tun Hussein Onn, Malaysia)

Electrical energy is important and had been demand increasingly. A lot of energy resources have been wasted and exhausted. An alternative way to generate electricity by using a population of human had been discovered When walking, the vibration that generates between the surface and the footstep is wasted. By utilizing this wasted energy, the electrical energy can be generated and fulfill the demand. The transducer that use to detect the vibration is a piezoelectric transducer. This transducer converts the mechanical energy into electrical energy. When the pressure from the footstep is applied to the piezoelectric transducer, it will convert the pressure or the force into the electrical energy. The piezoelectric transducer is connected in series-parallel connection. Then, it is placed on the tile that been made from wood as a model for footstep tile to give pressure to the piezoelectric transducers. This tile can be placed in the crowded area, walking pavement or exercise instrument. The electric energy that generates from this piezoelectric tile can be power up low power appliances.

15:00 *Solar Irradiance Uncertainty Management Based on Monte Carlo - Beta Probability Density Function for Case Study in Malaysia*

Norhafidzah Mohd Saad (Universiti Malaysia Pahang, Malaysia)

In recent years, solar PV power generation has seen a rapid growth due to environmental benefits and zero fuel costs. In Malaysia, due to its location near the equator, makes solar energy the most utilized renewable energy resources. Unlike conventional power generation, solar energy is considered as uncertain generation sources which will cause unstable energy supplied. The uncertainty of solar resource needs to be managed for the planning of the PV system to produce its maximum power. The statistical method is the most prominent to manage and model the solar irradiance uncertainty patterns. Based on one-minute time interval meteorological data taken in Pekan, Pahang, West Malaysia, the Monte Carlo - Beta probability density function (Beta PDF) is performed to model continuous random variable of solar irradiance. The uncertainty studies are needed to optimally plan the photovoltaic system for the development of solar PV technologies in generating electricity and enhance the utilization of renewable energy, especially in tropical climate region.

15:20 *Device Simulation of Perovskite Solar Cells with Molybdenum Disulfide as Active Buffer Layer*

Ainon Shakila Shamsuddin (KDU University College Sdn Bhd, Malaysia); Puteri Nor Aznie Fahsyar and Norasikin Ahmad Ludin (Universiti Kebangsaan Malaysia, Malaysia); Ibrahim Burhan (Politeknik Banting Selangor, Malaysia); Salina Mohmad(KDU University College Sdn Bhd, Malaysia)

Organo-halide Perovskite Solar Cells (PSC) have been reported to achieve remarkably high power conversion efficiency (PCE). A thorough understanding of the role of each component in solar cells and their effect as a whole is still required for further improvement in PCE. In this paper, the effect of Molybdenum Disulfide (MoS2) in PSC in planar structure configuration was analyzed using Solar Cell Capacitance Simulator (SCAPS). With the MoS2 layer which having two-fold function, acting as a protective layer, by preventing the formation of shunt contacts between perovskite and Au electrode, and as a hole transport material (HTM) from the perovskite to the Spiro-OMETAD. As simulated, PSC demonstrates a PCE, η of 13.1%, along with stability compared to typical structure of PSC without MoS2 ($\Delta \eta / \eta$ =-9% vs. $\Delta \eta / \eta$ =-6%). The results pave the way towards the implementation of MoS2 as a material able to boost shelf life which very useful for new material choice and optimization of HTMs.

Wednesday, November 28 15:40 - 16:00

Afternoon Break

Wednesday, November 28 16:00 - 17:40

CE 2

Communication Engineering2
Room: Room2

16:00 *Zinc Oxide Nanoparticles Based Passive Saturable Absorber for Pulse Generation in Fiber Laser*

Nurul Alina Afifi Norizan and Muhammad Quisar Lokman (MJIIT, Universiti Teknologi Malaysia, Malaysia); Hafizal Yahaya (Universiti Teknologi Malaysia, Malaysia); Sulaiman Wadi Harun (Uni Malaya, Malaysia); Fauzan Ahmad (MJIIT, Universiti Teknologi Malaysia, Malaysia)

A stable passive Q-switched pulsed generation in Erbium doped fiber laser by Zinc Oxide nanoparticles embedded in polyvinyl alcohol (ZnONP-PVA)-based saturable absorber is demonstrated in this paper. The surface morphology and thickness profile of the fabricated film were observed using FESEM and 3D measuring laser microscope with the measured thickness of 12 μm. Meanwhile the its optical properties is characterized using Raman spectroscopy. The developed ZnONP-PVA film, has modulation depth of 7.8 % and intensity saturation of 88.97 MW/cm2. The threshold input pump power to generate Q-switched pulse is at 45.4 mW and can be tuned until 92.4 mW before the pulse diminished. The operating wavelength of generated pulse is at 1535 nm with 3 dB bandwidth approximately of 2 nm with exclusion of parasitic continuous wave lasing. As the input pump power was tuned from threshold to maximum value, the recorded pulse train of repetition rate is tunable from 73.53 kHz to 103.10 kHz while the pulse width decreases from 6.8 μs to 4.8 μs. The calculated maximum output power and pulse energy at maximum input pump power was 5.14 mW and 49.85 nJ, respectively. The measured signal to noise ratio was 56 dB indicated that the generated pulse by ZnO NP based passive saturable absorber was stable.

16:20 *Graphene Slurry Based Passive Q-Switcher in Erbium Doped Fiber Laser*

Siti Nur Fatin Zuikafly (MJIIT, Universiti Teknologi Malaysia, Malaysia); Nor Farhah Razak (Pusat Permata Pintar Negara UKM, Malaysia); Sulaiman Wadi Harun (Uni Malaya, Malaysia); Rizuan Mohd Rosnan (Jeol (Malaysia) Sdn. Bhd, Malaysia); Fauzan Ahmad (MJIIT, Universiti Teknologi Malaysia, Malaysia)

In this work, a Graphene slurry based passive Q-switcher fabricated from Graphene- Polylactic acid (PLA) filament which is used for 3D printing. To produce the Graphene slurry, the diameter of the filament was reduced and Tetrahydrofuran (THF) was used to dissolve the PLA. The Graphene-THF suspension was drop cast to the end of a fiber ferrule and the THF then evaporated to develop Graphene slurry based SA which is integrated in fiber laser cavity. A stable passively Q-switched Erbium-doped fiber laser (EDFL) operating at 1531.01 nm was observed with the threshold input pump power of 30.45 mW and the maximum input pump power of 179.5 mW. By increasing the input pump power from 30.45 mW to 179.5 mW, the pulse train of repetition rates increases from 42 kHz to 125 kHz, while the pulse width reduces from 6.74 micro seconds to 2.58 micro seonds. The generated pulsed produced maximum pulse energy and maximum peak power of 11.68 nJ and 4.16 mW, respectively at maximum input pump power. The recorded signal to noise ratio of about 44 dB shows that the proposed Graphene slurry based saturable absorber is able to produce pulsed laser with good stability and low fluctuation.

16:40 *Observation of Dark and Bright Pulses in Q-switched Erbium Doped Fiber Laser Using Graphene Nano-Platelets as Saturable Absorber*

Nur Hidayah Muhamad Apandi and Siti Nur Fatin Zuikafly (MJIIT, Universiti Teknologi Malaysia, Malaysia); Nabilah Kasim (Universiti Teknologi Malaysia, Malaysia); Mohd Ambri Mohamed (Universiti

Kebangsaan Malaysia (UKM), Malaysia); Sulaiman Wadi Harun (Uni Malaya, Malaysia); Fauzan Ahmad (MJIIT, Universiti Teknologi Malaysia, Malaysia)

In this paper, a passively Q-switched Erbium doped fiber laser (EDFL) by residing Graphene nanoplatelets (GnPs) embedded in polyvinyl alcohol (PVA) based saturable absorber (SA) is demonstrated. To aid the dispersion of GNPs, a surfactant is used and then it is mixed with polyvinyl alcohol (PVA) as host polymer to develop GnPs-PVA film based passive SA. The GnPs-PVA based film then integrated in laser cavity in ring cavity configuration for pulse laser generation. The experimental works show that the proposed passive SA operates at input pump power range from 77 mW to 128 mW with a tunable repetition rate from 78.4 kHz to 114.8 kHz and a shortest pulse width of 3.69 μs. The laser produces maximum instantaneous output peak power and pulse energy of 7.3 mW and 30.46 nJ, respectively and accompanied by signal to noise ratio (SNR) of 64 dB.

17:00 *All Optical Millimeter-Wave Signal Generation and Transmission for Radio over Fiber (RoF) Link*

Norliza Mohamed (Universiti Teknologi Malaysia & Razak School of Engineering and Advanced Technology, Malaysia); Sevia Mahdaliza Idrus (Faculty Of Electrical Engineering & Universiti Teknologi Malaysia, Malaysia); Azura Hamzah (Universiti Teknologi Malaysia, Malaysia); Suriani Mohd Sam (University Technology Malaysia, Malaysia); Norulhusna Ahmad, Hazilah Mad Kaidi and Rudzidatul Dziyauddin (Universiti Teknologi Malaysia, Malaysia)

Fiber-based wireless system has become a promising solution as a cost-effective communication and it offers high capacity network with millimeter-wave (mm-wave) signal transmission. The system significantly offers superior possible bandwidths for both fiber and free-space applications. Hence, with the increased capacity as well as wireless mobile network applications particularly at mm-wave signal, radio over fiber (RoF) technology is the utmost option. Nevertheless, when high frequency signal transmission is involved, power fading or dispersion effect limits the performance of RoF link. Therefore, this work proposed a RoF system by integrating remote optical local oscillator (LO) with frequency up-conversion at the base station (BS). All optical mm-wave signal are generated and transmitted for the RoF link. The effects of the changes of fiber loop length, optical power of the continuous wave (CW) optical laser carrier and responsivity value of the p-i-n photodiode (PD) mainly at 40 GHz are investigated and the power fading effects are discussed.

CE 3

Communication Engineering 3
Room 3

16:00 *Compact U-Shaped Slotted Antenna with Conductor-Backed Plane for Ultra-Wideband (UWB) Applications*

Siti Zubaidah Aziz (Universiti Sains Islam Malaysia, Malaysia); Faizal Jamlos (Universiti Malaysia Perlis, Malaysia); M Norazizi Sham Mohd Sayuti and Marinah Othman (Universiti Sains Islam Malaysia, Malaysia)

This paper proposes a novel, compact, and printed square patch antenna for ultra-wideband (UWB) applications. The proposed antenna has dimension of 18 x 12 mm^2 and consists of a U-slot in the radiating patch with a U-shaped conductor-backed plane. Some modifications in the partial ground plane with triangular slits and slots are proposed. In order to validate the performance of the proposed antenna, simulated and experimental results are presented. Based on the results, the modification improves the impedance bandwidth by providing a wide practical bandwidth from 2.69 up to 15.52 GHz.

16:20 *Graphene Based Antenna Fabricated by Screen Printing Method for 5G Applications*

Siti Nor Hafizah Sa'don and Mohd Haizal Jamaluddin (Wireless Communication Centre, Universiti Teknologi Malaysia, Malaysia); Muhammad Ramlee Kamarudin (Centre for Electronic Warfare Information and Cyber, Cranfield University, Shrivenham, United Kingdom); Fauzan Ahmad (MJIIT, Universiti Teknologi Malaysia, Malaysia)

The save and fast manufacturing are required in order to achieve 5G technology. However, there are many kinds of manufacturing antenna which are depending on material applied in the antenna itself. Each type of manufacturing also has its own advantages and drawback. In this article, a graphene antenna for 5G applications is manufactured using screen printing method. A fine mesh resolution of 120 μm is used to print the antenna accurately. This kind of printing has capability to produce antenna in less than 5 minutes. The antenna made by conductive graphene ink has size of 11.8 x 12.2 x 0.076 mm3 and produced within a small amount of graphene ink. The measured antenna resonates at 15.04 GHz with reflection coefficient magnitude of -12.05 dB and percentage impedance bandwidth is 30 % which is in the range of 13.3 to 18.0 GHz. The radiation pattern at E-plane and H-plane of the graphene antenna are simulated and measured where the result obtained are comparable.

16:40 *45 Degree Arrangement of Compact Array Antenna for MIMO Application*

Muhammad Faizal Ismail (Universiti Tun Hussein Onn Malaysia & Centre for Diploma Studies, Malaysia); Huda A. Majid, Mohd Nurul Al-Hafiz Sha'abani and Mohd Sabani Mohd (Universiti Tun Hussein Onn Malaysia, Malaysia); Farid Zubir(Universiti Teknologi Malaysia & Faculty of Electrical Engineering,

Malaysia); Osman Bin Ayop (Universiti Teknologi Malaysia, Malaysia); Muhammad Azfar Abdullah (Agensi Angkasa Negara, Malaysia)

A study on the compact array microstrip patch antenna for multiple-input multiple-output (MIMO) communication system based on the antenna arrangement is performed. The 2.45 GHz rectangular array are arranged in 45 degree slanted inward and outward for each other to reduce the mutual coupling effect between the patches. The antenna properties are analyzed and compact antenna design is determined based on the simulation results. The results show the antennas can very compact while maintaining low mutual coupling. The gain of the MIMO antenna is 11.3 dBi. The simulated and tested return losses, together with the radiation patterns, are presented and discussed.

17:00 *Wide-band Metamaterial Antenna Design Based on Transmission Line with Rectangular Rings*

Adamu Y Iliyasu (Kano University of Science and Technology Wudil, Nigeria); Mohamad Rijal Hamid, Mohamad Kamal A. Rahim, Mohd Fairus Mohd Yusoff and Noor Asmawati Samsuri (Universiti Teknologi Malaysia, Malaysia)

This paper presents the design of Wideband Metamaterial Antenna Design based on Transmission Line with rectangular rings. The design is based on both transmission line and resonant approach of metamaterial antenna design. The main contribution of this work is to show the possibility of simultaneously utilizing the function of left handed parameters with two techniques in one compact antenna with overall dimension of 16.80 by 30.0 [(mm)]^2 for bandwidth enhancement. This is achieved by creating horizontal slot between top and bottom patch, rectangular resonating rings in both patches and cutting the edge of the bottom patch. A comprehensive analysis and simulation using Computer Simulation Technology (CST) software was used to determine the operation of proposed antenna and effectiveness of the design concept. From the simulation result, it was found that, the antenna has a wideband with switching frequency from 2.3 to 5.5 GHz which is equivalent to bandwidth of 3.2 GHz and fractional bandwidth of 91%. It has two resonating bands at 2.4 GHz and 5.0 GHz with realized peak gain of 2.23 dB and 3.12 dB respectively and average radiation efficiency of 96%. The bandwidth coverage showed that, it can be used for Bluetooth, Wi-Fi, and WLAN application.

CE1

Communication Engineering 1
Room: Room1

16:00 *Heterogeneous Modelling Framework for 5G Urban Macro Ultra Dense Networks*

Fayad Ghawbarr, Faiz Asraf Saparudin, Jumadi Abdul Sukor, Aimi Syamimi Ab Ghafar and Norshidah Katiran (Universiti Tun Hussein Onn Malaysia, Malaysia)

The explosive growth of mobile devices is the main engine to continue evolution in the communications field. The amount of traffic generated by today's users in applications such as high definition videos, cloud computing, and wearable devices, require a drastic change in mobile telecommunications. 5G Ultra Dense Network (UDN) is one of the key components leading in achieving the high capacity for all users. In UDN, the number of base stations or access nodes equals or exceeds the number of active users by unit area. In this paper, different modeling techniques of UDN are studied. Moreover, a heterogeneous framework modeling was proposed. This framework illustrated a system model for UDN based on Urban Macro (UMa) Scenario. The distance dependent path loss model for UMa was presented and analyzed. The Simulation results of path loss model indicated an increase in the path loss with increasing the distance range from 10m to 500m. The received power simulation results of User Terminal (UT) displayed the power is approaching zero when the distance between the BS and UT goes beyond 250m. Therefore, it is assumed that UTs located 250m away from the BS can reuse the subchannel of AN in another sector with negligible interference.

16:20 *Performance Evaluation of Video Streaming on LTE with Coexistence of WiFi Signal*

Yaqoob Yaghoubi, Wai Leong Pang and Siew Kin Wong (Multimedia University, Malaysia); Chan Kah Yoong (, Malaysia)

The continuous growth in mobile data traffic and limited license wireless spectrum have led to dramatically increase the demand of radio spectrum. It is widespread the concern about the coexistence of Long Term Evolution (LTE) and WiFi in the unlicensed band. There are several techniques have been proposed to enable the coexistence of LTE and WiFi in unlicensed band, but these works are targeted on the impact of the LTE to the WiFi network performance. An experimental is carried out in this work to evaluate the impact of WiFi signal on the video streaming in LTE network. The experimental test comprised of the National Instrument (NI) Universal Software Radio Peripheral (USRP) 2953R that is controlled by the LabVIEW Communication LTE Application Framework. Extensive experiments are carried out under two scenarios, i.e. (1) coexistence of LTE and WiFi signal; (2) LTE signal only. Performance evaluations are carried out with different Modulation and Coding Schemes (MCS) values and different mode of operations, i.e. Frequency Division Duplex (FDD) and Time Division Duplex (TDD) mode. The results illustrated that the interference from WiFi signal caused the performance degradation on LTE network in throughput and the power received by User Equipment (UE).

16:40 *Modeling of Power Spectral Density of V2V Channel in the Presence of Moving Scatterers*

Wahyu Pamungkas (Institut Teknologi Telkom Purwokerto & Departemen Teknik Elektro, Institut Teknologi Sepuluh Nopember (ITS) Surabaya, Indonesia); Titiek Suryani (Institut Teknologi Sepuluh Nopember,

Indonesia); Iwan Wirawan (ITS, Indonesia); Achmad Affandi (Institut Teknologi Sepuluh Nopember, Indonesia)

Vehicular channel modeling was generally developed to be as close as the real conditions. Communication system V2V consists of a transmitter, receiver, and scatterers which can move in random speeds and directions to produce Doppler effects that reduce communications system performance. The Doppler effect that occurs in V2V channel modeling is a combination of Doppler effects on each of its constituent components. However, this modeling has not discussed the influenced of The Doppler effects on power spectral density parameters. Though the magnitude of the Doppler effect can reduce the power spectral density parameters of the received signal. The purpose of this study was to examine the effects of velocity parameters of V2V's components towards power spectral density where scatterers moved randomly. Moving scatterer speed is classified into two categories, namely moving ahead of the sender and receiver and moving more slowly than the sender and receiver. The Power spectral density was calculated after combining QPSK modulation with multi-carrier OFDM. The results showed that higher velocity of the components yielded more damped power spectral density on the receiver. Moreover, the number of scatterers that moved around the transmitter and receiver highly affected the magnitude of Doppler effects.

17:00 *Comparing Selected Mapping and Partial Transmit Sequence for PAPR Reduction in GFDM Systems*

Ari Endang Jayati (Institut Teknologi Sepuluh Nopember & Universitas Semarang, Indonesia); Wirawan Wirawan and Titiek Suryani (Institut Teknologi Sepuluh Nopember, Indonesia); E Endroyono (ITS & Institut Teknologi Sepuluh Nopember, Indonesia)

Generalized Frequency Division Multiplexing (GFDM) as one of the 5G candidates to overcome the shortcomings of Orthogonal Frequency Division Multiplexing (OFDM), high peak rating power ratio (PAPR) and high Out of Band (OOB) radiation. GFDM has a low PAPR due to the use of a few subcarriers. The purpose of this paper is to compare the two algorithms to reduce PAPR if applied to the non-linear distortion-affected GFDM system. Partial Transmit Sequence (PTS) and Selected Mapping (SLM) are selected because this technique does not distort the signal so it does not change the spectrum of the signal. The simulation result shows PAPR GFDM is not significantly affected by nonlinear distortion. However, for a 5G application with thousands of devices, this value should still be reduced. After being given a PTS, the PAPR value drops to the value according to the 5G criterion. Better PTS performance decreases PAPR for GFDM systems that are given nonlinear distortion when compared to SLM.

CME 1

Control and Mechatronic Engineering
Room 7

16:00 *Performance Comparison of SVM and ANN for Aerobic Granular Sludge*

Nur Sakinah (Universiti Teknologi Malaysia, Malaysia); Norhaliza Abdul Wahab (Research Supervisor, Malaysia); Aznah Nor Anuar (Universiti Teknologi Malaysia, Malaysia); Mustafa Bob (Taibah University, Saudi Arabia)

One of the promising technology in the wastewater treatment field is Aerobic Granular Sludge (AGS) technology. Most of the current models for the system are fundamentally complex, uncertainty and non-linearity of the system makes it hard to predict. It is essential to provide a good tool in predicting the performance through a reliable model of Wastewater Treatment Plant (WWTP). Hence, this paper present the comparison of different data mining on prediction of AGS in terms of Chemical Oxygen Demand (COD). After feature analysis, three models including Support Vector Machine (SVM), Dynamic Neural Network and Feed-Forward Neural Network (FFNN) was developed, validated and compared. The simulation of the model uses the experimental data obtained from Sequencing Batch Reactor (SBR) under temperature of 30°C, 40°C and 50°C respectively. The overall result indicated that SVM with the highest accuracy of 90 above for all the three different temperature as compared to dynamic and feed-forward neural network. This shows that SVM is a useful tool in predicting the effluent quality of WWTP.

16:20 *F-score and Rough Set Based Feature Selection for Breast Cancer Diagnosis*

Elvira Sukma Wahyuni (Universitas Islam Indonesia, Indonesia); Noor Akhmad Setiawan and Hanung Adi Nugroho (Universitas Gadjah Mada, Indonesia); Rafky Rifaldi (Universitas Islam Indonesia, Indonesia)

Diagnosis of breast cancer has been widely implemented using machine learning. However, in medical data analysis, breast cancer diagnosis is usually faced with high dimensional features. The high dimensional features sometimes contain irrelevant features toward the classification process. Feature selection is a method to eliminate irrelevant features. It can improve the performance of diagnosis. The objective of this research is to develop a feature selection method for breast cancer diagnosis based on combination of rough set and F-score feature selection method. Performance of combination features selection was applied in Wisconsin Breast Cancer Dataset (WBCD). F-score and Rough set are combined subsequently by applied Rough set firstly. Than the result of reduced subset feature by Rough set will be selected with F-score. Improvement the performance of diagnosis would be evaluated based on the average of sensitivity, ROC AUC, accuracy, and running time with 100 times experiment. Furthermore, the results would be compared with the performance of feature selection method when it is applied individually and simultaneously. The result shows that the combination of F-score and rough set achieves the optimal feature and superior performance compared with F-score and Rough set when applied individually. The obtained of sensitivity 0.9714, ROC AUC 0.9700, accuracy 97.05%, and the running time 0.0722 s.

16:40 *Auto-CDD: Automatic Cleaning Dirty Data in Data Analytical Process Using Machine Learning Paradigm*

Jesmeen M. z. h. (Multimedia University, Malaysia); Abid Hossen (Khulna University, Bangladesh); Md. Jakir Hossen, J. Emerson Raja, Bhuvaneswari Thangavel, Md. Shohel Sayeed and Chy. Mohammed Tawsif Khan (Multimedia University, Malaysia)

Cleaning the dirty data has become very critical significance for many years, especially in medical sectors. This is the reason behind widening research in this sector. To initiate the research, it will guarantee to overcome processing unwanted outcomes in data Analytical process; second, it will improve overall data processing. Our motivation is to create an intelligent tool that will automatically predict the missing data. Starting with feature selection using Random Forest Gini Index values. Then by using three Machine Learning Paradigm trained model was developed and evaluated by two datasets from UCI (i.e. Diabetics and Student Performance). Evaluated outcomes of accuracy proves Random Forest Classifier and Linear Regression gives constant accuracy at around 90%. This process will help to get clean data for further analytical process. Finally, a comparison between currently used functions of handling missing values and Auto-CDD is presented.

17:00 *Dimentionality Reduction Based on Binary Cooperative Particle Swarm Optimization*

Sharifah Sakinah Syed Ahmad (Universiti Teknikal Malaysia Melaka, Malaysia)

Although many more complex classifiers algorithms exist, k-Nearest Neighbor (k-NN) is one of the most successful methods for solving real-world problems. The effectiveness of the classification process is based on the data contained in the training set. Applying k-NN classifier to a real world problem suffers from several problems such as they are computationally expensive classifiers since that the whole training set must be stored in the computer to classify the unseen data. In addition, k-NN classifier is intolerant with the irrelevant features. On the other hand, the training data might be imbalanced where the numbers of data in some classes are extremely bigger than other classes. Therefore one possible way to improve the k-NN classifier with large datasets is by using selected training data. In this paper, we present an alternative way to improve data selection by integrating the feature selection and instances selection simultaneously for k-NN classifier using Cooperative Binary Particle Swarm Optimization (CBPSO). This approach can overcome the limitation of using the k-nearest neighbor classifier especially when dealing with high dimensional and imbalance data. A comparison study using 20 real world dataset from the UCI Machine Learning Repository to shows the performance of our approach. The algorithm's performance is illustrated by the corresponding table of the classification rate. The experimental results demonstrate the effectiveness of our proposed method

ECE 1

Electronic and Computer Engineering 1
Room 5

16:00 *Denoising Performance Analysis of Adaptive Decision Based Inverse Distance Weighted Interpolation (DBIDWI) Algorithm for Salt and Pepper Noise*

Vorapoj Patanavijit (Assumption University, Thailand)

Due to its superior performance for denoising an image, which is contaminated by impulsive noise, an adaptive decision based inverse distance weighted interpolation (DBIDWI) algorithm is one of the most dominant and successful denoising algorithm, which is recently proposed in 2017, however this DBIDWI algorithm is not desired for denoising the full dynamic intensity range image, which is comprised of min or max intensity. Consequently, the research article aims to study the performance and its limitation of the DBIDWI algorithm when the DBIDWI algorithm is performed in both general images and the images, which are comprised of min or max intensity. In this simulation experiments, six noisy images (Lena, Mobile, Pepper, Pentagon, Girl and Resolution) under salt&pepper noise are used to evaluate the performance and its limitation of the DBIDWI algorithm in denoised image quality (PSNR) perspective.

16:20 *A Novel Elementary Spatial Expanding Scheme Form on SISR Method with Modifying Geman&Mcclure Function*

Darun Kesrarat and Vorapoj Patanavijit (Assumption University, Thailand); Kornkamol Thakulsukanant (ABAC, Thailand)

Because of the feasible and impressive fallout, the classical Super-Resolution Reconstruction (SRR) is the contemporary algorithm for improving spatial information and reducing noise and SISR (Single-Image Super-Resolution) method, which is form on the classical SRR, is solely developed for improving spatial information. Disastrously, deficiency of the classical SISR method is conceptually computed from three specifications (b, h, k) and the simulating calculation of the optimized specifications for interpolating the better and higher spatial information images with highest PSNR is so burdersome. For figuring out this issue, the Geman&Mcclure function is proposed to replace with the ordinary SISR function because this function is conceptually computed from only one specification (T), contrary to three specifications similar to classical SISR method hence this analytic article focuses to offer a novel elementary spatial expanding scheme form on SISR method with modifying Geman&Mcclure function. By examining on bountiful images, which are debased by copious outlier patterns, in analytical observation section, the impressive fallout of a novel elementary spatial expanding scheme approximately matches to classical SISR method nevertheless the simulating calculation of the optimized specification is so readily and rapidly compared with classical SISR method (with three specification). From these reason, a novel elementary spatial expanding scheme is easily implemented for real works.

16:40 *Energy Extraction Method for EEG Channel Selection*

Hilman Fauzi (Telkom University, Indonesia & Universiti Teknologi Malaysia, Malaysia); Masaki Kyoso (Tokyo City University, Japan); Ibrahim Shapiai (Malaysia-Japan International Institute of Technology (MJIIT), Malaysia); Tadayasu Komura(Tokyo City University, Japan); Uswah Khairuddin (Universiti Teknologi Malaysia, Malaysia); Muhammad Azzam (Chaosmatic Co. Ltd, Indonesia)

Channel selection is an improvement technique to optimize EEG-based BCI performance. In previous studies, many channel selection methods—mostly based on spatial information of signals—have been introduced. One of these channel selection techniques is the energy calculation method. In this paper, we introduce an energy optimization calculation method, called the energy extraction method. Energy extraction is an extension of the energy calculation method, and is divided into two steps. The first step is energy calculation and the second is energy selection. In the energy calculation step, l2-norm is used to calculate channel energy, while in the energy selection method we propose two techniques: "high value" (HV) and "close to mean" (CM). All proposed framework schemes for energy extraction are applied in two types of two classes datasets, motor movement (hand and foot movement) and motor imagery (imagination of left and right hand movement). The system used a Common Spatial Pattern (CSP) method to extract EEG signal features and k-NN as a classification method to classify the signal features with k = 3. Based on the test results, all schemes for the proposed energy extraction method yielded improved BCI performance of up to 58%. In summary, the energy extraction approach using the CM energy selection method was found to be the best channel selection technique.

17:00 *MDSS-Stream: A Data Stream Clustering Algorithm for Multi-Dimensional Density Data*

Mayas Aljibawi (Faculty of Information Science and Technology, Universiti Kebangsaan Malaysia, Malaysia); Mohd Zakree Ahmad Nazri and Zalinda Othman (Universiti Kebangsaan Malaysia, Malaysia)

The development of Internet-of-Things (IoT) technologies is increasing at an undiminished rate. The IoT embedded in a system requires a robust algorithm for clustering a vast amount of data streaming online, in real time. Processing such an amount of data in real time requires an efficient algorithm and sufficient memory. The density-based method has emerged as an essential method for clustering data streams. In this paper, a new online-offline phase algorithm for Multi-Density Speed Stream (MDSS) clustering is proposed. Different benchmark datasets have been used in this study. In addition, a comparison with the state of the art which called MuDi-Stream has been conducted. The experimental results show that the proposed MDSS-Stream has superior performance regarding memory allocation compared to the MuDi-Stream.

ECE 2

Electronic and Computer Engineering 2
Room 6

16:00 *A Texture Feature Analysis of Breast Thermogram Images for the Detection of Breast Cancer*

Surekha Kamath (Manipal University & MIT, India)

Early detection of breast cancer is very important as it increases the survival rate of woman by providing proper treatment options. Breast thermography is an emerging medical imaging technique, which can be used with other imaging modalities like mammography, ultrasound, MRI for early detection of breast cancer. Breast thermography is based on the observation that malignant breast tumors emit greater heat than healthy breast, due to higher metabolic activity of cancerous cells and vascularization. It is a non-invasive, non-radiating, passive, fast, painless, low cost, risk free imaging method, which is suitable for women of all ages, including pregnant and nursing women. In order to increase the rate of diagnosis, Computer Aided Detection (CAD) techniques are used. Accuracy of CAD for breast thermography depends on segmentation, extraction of relevant features and classifier used. This article describes asymmetry analysis of texture features extracted from segmented left and right breast thermogram images. We have extracted various spatial and spectral features and the significance of these features in highlighting the asymmetry in the breast are found by statistical t-test. The dimension of spectral features is reduced by Principal Component Analysis. Finally selected features are fed to Artificial Neural Network for training and Classification. Classifier accuracy is the standard used for analysis. Experimental results show that spectral features performed better in comparison with spatial features in detection of abnormality present in the breast thermogram images

16:20 *Machine Vision Based Smart Parking System Using Internet of Things*

Yusmeeraz Yusof, Suhaila Isahak and Norlina Paraman (Universiti Teknologi Malaysia, Malaysia)

It is expected that in the next decade, majority of world population will be living in cities. Better public services and infrastructures in the city are needed to cope with the booming population. City vehicles that cruising for parking have indirectly causing traffic, making one harder to travel around the city. Thus, a smart parking system can certainly lays the foundation to build a smart city. This paper proposed a cost-effective IoT smart parking system to monitor city parking space and provide real-time parking information to drivers. Moreover, instead of the conventional approach that uses embedded sensors to detect vehicles in the parking area, camera image and machine vision technology are used to obtain the parking status. In the prototype, twenty outdoor parking lots are covered using a 5 megapixel camera connected to Raspberry Pi 3 installed at the 5th floor of the nearby building. Machine vision in this project that involved motion tracking and Canny edge detection are programmed in Python 2 using OpenCV technology. Corresponding data is uploaded to an IoT platform called Ubidots for possible monitoring activity. An Android mobile application is designed for user to download real-time data of parking information. This paper introduces a low cost smart parking system with the overall detection accuracy of 96.40%. Also, the mobile application allows users to alert other car owners for any emergency incidents and double parking blockage. The developed system can provide a platform for users to search for empty car parking with ease and reduce the traffic issues such as illegal double parking especially in the urban area.

16:40 *RTL Design of a Fast 2-D Hadamard Transform for HEVC Video Encoder*

Whit Ney Heh (Universiti Malaysia Pahang & Universiti Malaysia Pahang, Malaysia); Ab Al-Hadi Ab Rahman (Universiti Teknologi Malaysia, Malaysia); Ainy Haziyah Binti Awab (University of Technology Malaysia, Malaysia); Mohd Shahrizal Rusliand Usman Ullah Sheikh (Universiti Teknologi Malaysia, Malaysia); Kam Meng Goh (Tunku Abdul Rahman University College, Malaysia)

This paper presents the register-transfer-level design of the 2-dimensional Hadamard transform for state-of-the-art HEVC video encoder. The transform is mainly used in the sum of absolute transform difference module to determine suitable sizes for block prediction in the encoder. The proposed design achieves both scalability and performance by 1) implementing a unified architecture for sizes 4x4 to 32x32, and 2) pipelining and feed through control that allows high performance for all block sizes. The design starts with high-level algorithmic loop unrolling optimization to determine suitable level of parallelism. Based on this, a suitable hardware architecture is devised using transpose memory buffer as pipeline memory for maximum performance. Results for Xilinx Kintex Ultrascale implementation indicate variable performance obtained for different block sizes and higher operating frequency compared to a similar work in literature.

17:00 *Online Video-Based Abnormal Detection Using Highly Motion Techniques and Different Statistical Measures*

Ahlam Al-Dhamari (Universiti Teknologi Malaysia & Hodeidah University, Malaysia); Rubita Sudirman, Nasrul Humaimi Mahmood, Nor Hisham Khamis and Azli Yahya (Universiti Teknologi Malaysia, Malaysia)

At the essence of video surveillance, there are abnormal detection approaches, which have been proven to be substantially effective in detecting abnormal incidents without a prior knowledge about these incidents. Based on the state-of-the-art research, it is obvious that there is a trade-off between frame processing time and detection accuracy in abnormal detection approaches. Therefore, the main challenge is to balance this trade-off suitably by utilizing few, but very descriptive features to fulfill online performance while maintaining a high accuracy rate. In this study, we propose a new framework, which achieves the balancing between detection accuracy and video processing time by employing two efficient motion techniques. Specifically, foreground and optical flow energy. Moreover, we employ different statistical analysis measures of motion features to get robust inference method to distinguish abnormal behavior incidents from normal ones. The performance of this framework has been extensively evaluated in terms of the detection accuracy, the area under the curve (AUC) and frame processing time. Simulation results and comparisons with ten relevant online and non-online frameworks demonstrate that our framework efficiently achieves superior performance to those frameworks, in which it presents high values for the accuracy while attaining simultaneously low values for the processing time.

EPE 1

Electrical Power Engineering 1
Room 4

16:00 *Comparative Study on the Accelerated Thermal Aging Behavior Between Palm and Rapeseed Natural Ester Oils*

Nur Lidiya Muhammad Ridzuan (Universiti Teknikal Malaysia Melaka (UTeM), Malaysia); Norazhar Abu Bakar, Sharin Ab Ghani, Imran Sutan Chairul and Nur Hakimah Ab Aziz (Universiti Teknikal Malaysia Melaka, Malaysia)

The suitability of natural ester oils as an insulating medium in power transformers is discussed in this paper. Owing to environmental concerns, natural ester oils have great potential as mineral oil substitutes in power transformers. In this paper, the aging behaviors of palm and rapeseed natural ester oils were compared with that for mineral oil. The performance of these natural ester oils was assessed based on their properties (moisture content, acidity, and relative content of dissolved decay products) after accelerated thermal aging. The results showed that the palm oil has better performance compared to the rapeseed oil after accelerated thermal aging for 1500 h because of its lower acidity. This was further supported by the presence of sludge in the rapeseed oil after 1500 h of aging.

16:20 *Top Oil Heat Distribution Pattern of ONAN Corn Oil-Based Transformer with Presence of Hot Spot Study Using FEMM*

Nordiana Azlin Othman (Faculty of Electrical and Electronic Engineering, Universiti Tun Hussein Onn Malaysia, Malaysia); Nor Asiah Muhamad (Universiti Sains Malaysia, Malaysia); Hanafiah Kamarden (Universiti Teknologi Malaysia, Malaysia); Muhammad Saufi Kamarudin and Muhammad Azizi Husin (Universiti Tun Hussein Onn Malaysia, Malaysia)

Transformer thermal modelling is a crucial aspect to be considered as this may help the determination of heat capacity of transformer. This paper present, simulation study on Oil Natural Air Natural (ONAN) transformer heat distribution pattern with and without presence of hot spot temperature (HST). This paper aims to compare the effects of different HST value at different locations in side the transformer unit as well as to evaluate top oil the thermal behaviour of corn oil as cooling mechanism in a transformer. To achieve aforementioned objectives, three HSTs were introduced to the 30 MVA transformer winding to determine the total heat build-up in the top of the transformer tank. The outcome of thermal properties is examined using x-y temperature plot. From the results found that the location of

HST affects overall transformer's temperature. HST at the top of the winding give a significant effect compared to when HST is at the bottom of the winding. It is also evident that the usage of corn oil reduced the temperature distribution of the transformer. The findings suggest that the temperature distribution study especially on transformer is important to monitor in-service transformer in a non-invasive manner.

16:40 *Dielectric Properties of Virgin Coconut Oil*

Nor Asiah Muhamad (Universiti Sains Malaysia, Malaysia); Siti Syafiqah Mat Sauki and Zawani Amirah Rasid (School of Electrical Electronic Eng. Universiti Sains Malaysia, Malaysia)

The application of insulating liquid such as mineral oil in power transformer is very important to reduce the failure, ageing effect, increase the life span and act as a cooling medium (heat transfer agent). Mineral oil has a good dielectric strength and cooling performance but it has serious negative environmental impact such as non-biodegradable, non-renewable resource and difficult to dispose when the mineral oil deteriorates completely. Hence, virgin coconut oil(VCO) is chosen as alternative to replace mineral oil since it biodegrades completely without toxic and easy to obtained in the tropical country. Three dielectric tests are conducted to investigate the dielectric properties of VCO. Those are breakdown voltage, water content and kinematic viscosity. Then, this paper presents a study about the effect of the moisture level of VCO on the breakdown voltage and kinematic viscosity. VCO and mineral oil also undergoes heating process to reduce the moisture in sample. The study shows that VCO has good potential breakdown voltage with the ability to absorb a lot of moisture keeping the Kraft paper dry. However, VCO has very high kinematic viscosity compared to mineral oil. Further, the rate of breakdown voltage decreases with increasing of moisture of VCO is lower than mineral oil.

17:00 *Comparison of PI, PID and PI-FUZZY Controller in PEMFC Hydrogen Reformer*

Nor Aira Zambri (Universiti Tun Hussein Onn Malaysia, Malaysia); Norhafiz Salim (Universiti Teknikal Malaysia Melaka, Malaysia); Faridah Hanim Mohd Noh (Universiti Tun Hussien Onn Malaysia, Malaysia); Sim Sy Yi (University Tun Hussein Onn Malaysia, Malaysia)

The renewable energy technology has become very popular due to a major constraint in the existing electrical system such as high electricity demand, increased in fuel prices and concern of environmental pollution. The aims of this project are to develop a complete PEMFC model with hydrogen reformer by using MATLAB/ Simulink with three different controllers and comparison between the three controllers will be discussed in terms of output voltage of the system. This project presents the development of methods to solve the problem of PEMFC output voltage by using different controllers which are Proportional Integral (PI), Proportional Integral Derivatives (PID) and Proportional Integral Fuzzy (PI Fuzzy) controllers. The Ziegler Nicholas tuning method is used to tune PI and PID gains in a Simulink model. It helps the system to achieve a balance between performance and robustness for both controllers. The Mamdani type was used to develop the fuzzy controller in Simulink model. The transient performances that will be discussed are rise time, settling time, maximum overshoot, and percentage of overshoot. The results show that the proposed PI-Fuzzy is better than the conventionally used PI and PID controllers.

Thursday, November 29 8:00 - 9:00

Registration 2

Thursday, November 29 9:00 - 10:40

CE 4

Communication Engineering 4
Room: Room1

9:00 *Performance of Europium Aluminum Doped Polymer Optical Waveguide Amplifier*

Nur Najahatul Huda Saris (Malaysia Japan International Institute of Technology & Universiti Teknologi Malaysia, Malaysia); Azura Hamzah (Universiti Teknologi Malaysia, Malaysia); Sumiaty Ambran (Universiti Teknologi Malaysia & Malaysia-Japan International Institute of Technology, Malaysia); Osamu Mikami (Malaysia-Japan International Institute of Technology, UTM, Malaysia); Takaaki Ishigure (Keio University & Faculty of Science and Technology, Japan)

In this paper, the graded index (GI) multimode rare-earth metal (RE-M) doped polymer optical waveguide amplifier has been prepared and tested optically. A 10-cm Europium Aluminum Benzyl Methacrylate (EuAl_3 O_3/BzMA) was fabricated via a unique technique known as the "Mosquito Method" which utilizes a micro-dispenser machine. Optical gain from 75 to 150 μm circular core diameter waveguide of 13 wt.% concentration has been demonstrated and measured under forward pumping condition. The cladding monomer deployed in this research is Acrylate resin XCL01, which is a modified photo curable acrylate material. Fundamentally, -30 decibel (dB) red light signal

input and 23 dB pump power of 532 nm green laser wavelength are implemented within the range of 580 to 640 nm optical amplification wavelength. A maximum gain of 12.96 dB at 617 nm wavelength has been obtained for a 100 μm core diameter of Eu-Al polymer optical waveguide. The effect of different coupler diameter for pumping and the comparison of insertion loss before and after amplification against the performance of the Eu-Al polymer waveguide amplifier are also studied. There exists an optimum core diameter of which the amplifier gain enhancement is at maximum value.

9:20 *Simulation of Dual Stage Thulium-doped Fiber Amplifier Using Pump Power Distribution Technique*

Muhammad Syauqi Kusyairi Jamalus (Universiti Teknologi Malaysia Kuala Lumpur, Malaysia); Abdul Hadi Sulaiman (Universiti Tenaga Nasional, Malaysia); Nelidya Md. Yusoff (Universiti Teknologi Malaysia, Malaysia)

This paper shows dual stage thulium-doped fiber amplifiers (TDFAs) that use a pump power distribution technique. Simulations were done with signals ranging from 1975 nm to 2000 nm using the OptiSystem v.13 software. The results required were gathered from the software. The results of gain, noise figure, optical signal-to-noise ratio (OSNR) and output power were obtained. The highest gain and lowest noise figure results were achieved for the double pass dual stage TDFA configuration with values of 19.85 dB and 5.58 dB respectively, followed by the single pass dual stage TDFA. The OSNR and output power performances were also better for the double pass dual stage TDFA, obtaining 57.12 dB and 19.55 dB respectively. This study shows that thulium can be used in the 2 μm region as an active gain medium and the dual stage architecture and distributed pumping technique proves to be effective techniques to obtain the desired results.

9:40 *Single Mode Optical Fiber Tip Sensor for Glucose-Adulterated Honey Detection*

Nazirah Mohd Razali (Malaysia-Japan International Institute of Technology, Universiti Teknologi Malaysia, Malaysia); Aimi Najwa Mazlan (Universiti Teknologi Malaysia, Malaysia); Sumiaty Ambran (Universiti Teknologi Malaysia & Malaysia-Japan International Institute of Technology, Malaysia)

Honey, a natural sweet substance and also a high-value foodstuff has been a target for adulteration. This paper work reports the early stage development of tip fiber optic sensor using a standard single mode fiber for adulterated honey detection. The development of simple, sensitive and low-cost for direct detection of adulterated honey is considerable interest in this context. A pure stingless bee honey was mixed with glucose adulterant at different volume ratio for adulteration process. By changing this chemical composition, the refractive index of adulterated honey is varied, and Fresnel reflection occurs at the interface between the tip fiber and adulterated honey solution is then also changed. The average sensitivity achieved by this sensor is 0.27dB/% with linear regression value up 0.97. This shows, the sensor has potential for adulterated honey detection.

10:00 *Pulse Train Stability in Passively Mode-Locked Erbium-Doped Fiber Laser with a Nonlinear Polarization Rotation*

Azura Hamzah (Universiti Teknologi Malaysia, Malaysia); Nur Ameelia Abdul Kadir (Malaysia-Japan International Institute of Technology, Universiti Teknologi Malaysia, Malaysia); Nurul Alina Afifi Norizan (MJIIT, Universiti Teknologi Malaysia, Malaysia)

A nonlinear polarization rotation (NPR) technique-based mode-locked erbium-doped fiber laser (EDFL) has been experimentally demonstrated using a 0.75 m long highly concentrated erbium-doped fiber as the gain medium. With unintentional polarization dependent loss (PDL) induced by twisting single-mode fiber (SMF) in an intracavity polarization controller (PC), the optical output of the laser shifts from continuous wavelength (CW) to mode-locked soliton pulse. A stable and cleaner pulse with a repetition rate of 15.32 MHz laser wavelengths and a pulse energy of 0.496 nJ with optical signal-to-noise ratio of more than 33 dB are successfully obtained using a simple ring cavity.

CE 5

Communication Engineering 5
Room: Room2

9:00 *Gain Enhancement of Dielectric Resonator Antenna for Millimeter Wave Applications*

Irfan Ali and Mohd Haizal Jamaluddin (Universiti Teknologi Malaysia, Malaysia); Muhammad Ramlee Kamarudin (Cranfield University, United Kingdom (Great Britain)); Abinash Gaya (Universiti Teknologi Malaysia, Malaysia); Muhammad Hashim Dahri (University Technology Malaysia, Malaysia)

In this paper, the dielectric resonator antenna (DRA) with enhanced gain operating on the higher order mode ([TE]_δ15^x) is presented. The dielectric resonator antenna with dielectric constant ε_r of 10 and a loss tangent of 0.002 is used. The DRA is fed by microstrip line through an aperture slot. The proposed antenna is designed at 26 GHz and achieved a gain of 7.9 dBi with corresponding simulated radiation efficiency of 93%. The impedance bandwidth of 1.5 GHz from 25.1 GHz to 26.6 GHz has been achieved. The reflection coefficient, antenna gain, radiation patterns, and efficiency of the antenna are studied. Simulations are performed using CST microwave studio, and their results are presented.

9:20 *Wideband and High Gain Dielectric Resonator Antenna for 5G Applications*

Irfan Ali and Mohd Haizal Jamaluddin (Universiti Teknologi Malaysia, Malaysia); Muhammad Ramlee Kamarudin (Cranfield University, United Kingdom (Great Britain)); Abinash Gaya (Universiti Teknologi Malaysia, Malaysia); Raghuraman Selvaraju(Universiti Teknologi Malaysia & WCC, Malaysia)

In this paper, wideband high gain dielectric resonator antenna for 5G applications is presented. Higher order {TE}_δ15^x mode is exploited to enhance the antenna gain, while the array of symmetrical cylindrical shaped holes drilled in the DRA to improves the bandwidth by reducing the quality factor. The proposed DRA is designed using dielectric material with relative permittivity of 10 and loss tangent of 0. 002.The Rogers RT/Droid 5880 has been selected as substrate with relative permittivity of 2.2, loss tangent of 0.0009 and 0.254 mm thickness. The simulated results show that, the proposed geometry has achieved a wide impedance bandwidth of 17.3% (23.8-28.3GHz=4.5 GHz) for S11<-10 dB, and a maximum gain of about 9.3 dBi with radiation efficiency of 96% at design frequency of 26 GHz. The DRA is feed by 50Ω microstrip transmission line with slot aperture. The reflection coefficient, the radiation pattern, and the antenna gain are studied by full-wave EM simulator CST Microwave Studio. The proposed antenna can be used for the 5G communication applications such as device to device communication (D2D).

9:40 *Circularly Polarized Microstrip Patch Array Antenna for GPS Application*

Taher Khalifa (Segi University kota Damansara, Malaysia); Norsuzlin Bt Mohd Sahar (Space Science Centre (ANGKASA), Institute of Climate Change, University Kebangsaan, Malaysia.); Nurulazlina Ramli (SEGi University, Malaysia); Mohammad Tariqul Islam (University Kebangsaan Malaysia, Malaysia)

The 12 elements array antenna for GPS system having high gain with circular polarization is presented in this paper. The circularly polarized antenna is very suitable for the use of various wireless systems such as Global Positioning System with operating frequency is 1.27 GHz. The required bandwidth for a (CP) antenna can be larger than 20% for the multifunctional operations. The antenna consists of twelve main radiation patches connected in parallel. The antennas array are designed on the Rogers RT5880 substrate with a dielectric constant (ε_r) of 2.2 and thickness is 0.787 mm. The antenna is excited with an inset feed line and it operates in L-band with a resonant frequency of 1.27 GHz.

10:00 *5G Beam- Steering Antenna with Slotted Waveguide Antenna Array*

Noorlindawaty Md Jizat, Zubaida Yusoff and Nazihah Ahmad (Multimedia University, Malaysia); Mursyidul idzam Sabran and Nuramirah Mohd Nor (Universiti Teknologi Malaysia, Malaysia)

In this research paper, substrate integrated waveguide (SIW) was proposed as a technique by realizing bilateral edge walls to produce a compact 5G beam-steering antenna at 24GHz. The beam forming network is designed using 2×2 Butler Matrix (BM) fed with SIW slotted waveguide antenna array which steer the signal from -17 to 12 degrees when the signal is fed to the respective input ports. If one of the input ports is fed (Port 1), the signal will is evenly distributed between the output ports (Port 2 and Port 3) with 90 degree phase shift. The compact size of directional coupler was designed by design longitude slots on the surface of SIW substrate with bandwith of 16.85% at the operating frequency. The proposed antenna produce gain of 3dB at operating frequency and the promising outcome of the beam steering make proposed design suitable for 5G communications especially with tracking capabilities.

10:20 *3D Printed Horn Antenna Using Direct Metal Laser Melting Technique for Millimetre Wave Applications*

Muataz Watheq Almeshehe (Faculty of Electrical Engineeri, Universiti Teknologi Malaysia, Malaysia); Noor Asniza Murad and Mohamad Kamal A. Rahim (Universiti Teknologi Malaysia, Malaysia); Farid Zubir (Universiti Teknologi Malaysia & Faculty of Electrical Engineering, Malaysia)

A 3D printed horn antenna for millimetre waves (mmWave) applications is presented in this paper. The horn antenna is well known for high gain performance. The performance of the horn antenna manufactured using 3D printed technology is investigated in this work. The horn is designed based on WR-28 waveguide standard. The proposed horn is simulated using computer simulation technology (CST) software and fabricated using direct metal laser melting (DMLM) 3D printing technique. The 3D printing technique gives the antenna an advantage of being not just rapid manufactured but also low-cost and lightweight. However, several works reported on 3D printed devices highlight the affect of surface roughness on the performances. Therefore, the printed horn is profiled to correlate the surface roughness and dimension tolerance towards the performance. The printed horn is measured using standard VNA. The results show that the measured performance agreed fairly with the simulation with directive radiation pattern at 15 dBi gain. The printed horn has a weight of less than 130g and considerably working at Ka band regardless of the surface roughness resulted from the fabrication process.

CE 6

Communication Engineering 6
Room 3

9:00 *Non-radiative Wireless Energy Transfer with Single Layer Multiband Printed Spiral Resonator*

Lai Ly Pon, Sharul Kamal A. Rahim, Chee Yen Leow and Tien Han Chua (Universiti Teknologi Malaysia, Malaysia)

Accomplishing equilibrium in terms of transfer efficiency for multiband wireless energy transfer (WET) system remains as one of key concerns particularly in the implementation of a single transmitter device which supports simultaneous energy and data transfer

functionality. Three stages of design method are discussed in addressing the aforementioned concern. A single layer multiband printed spiral resonator for non-radiative wireless energy transfer operating at 6.78 MHz and 13.56 MHz is presented. By employing multi-coil approach, simulated power transfer efficiency for a symmetrical link separated at axial distance of 30 mm are 80.64% and 79.35% at the respective frequency bands. When operating distance is varied between 30 mm to 40 mm, consistency of simulated peak transfer efficiency above 50% is achievable.

9:20 *Prediction of Ammonia Concentration in Water Based on Microwave Spectroscop*

See Khee Yee (Universiti Tun Hussein Onn Malaysia & Lecturer, Malaysia)

Ammonia is a common pollutant in water as the result of runoff in agricultural areas where it is applied as fertilizer. It must be monitored regularly for safety purpose. The current testing technique does not allow on-site measurement as the equipment are bulky, the measurement process is time-consuming and tedious with additional mixing reagents. In this study, the presence of ammonia in distilled water is estimated from open-ended coaxial probe in the range of 200 MHz to 14000 MHz. Experimental results were obtained from two set of samples with seven different ammonia concentration each. The measurements are repeated thrice hence producing forty-two data sets with 550 points. Both curve fitting and multiple regression analysis were considered to perform valid ammonia concentration projection. Validation based on 5-fold and 10-fold cross validation suggested the feasibility of the techniques it presents root mean square error (RMSE) which is less than 0.02 in the ammonia prediction. Detection method based on open-ended probe would be convenient, simple and accurate method for in-situ determination of ammonia concentration.

9:40 *Comparison Between Distilled and Zamzam Water of Dielectric Dense Patch Antenna for Wireless Communication Applications*

Nur hidayah Moktar (Politeknik Sultan Idris Shah, Malaysia)

This paper was performed in order to analyze comparison between distilled and zamzam water of dielectric dense (DD) patch antenna for wireless communication applications. This antenna is proposed and designed using FR-4 substrate that sandwiched together to perform DD structure. The proposed antennas employ simple rectangular structure that fed with inset feeder surround by electromagnetic bandgap (EBG) structure. This antenna offers a wideband return loss of more than -10dB between 4.4123-5.5209Ghz and 7.1153 to 9.7034Ghz which can be applied in Wireless applications. It has been fabricated on 26x34 mm2 FR-4 board with a dielectric constant ε_r = 4.7, tangent loss, tan σ = 0.019 and thickness h= 1.6mm. Details of DD water antenna of center frequency for Wireless Application is presented and discussed.

10:00 *4-Coils Magnetic Resonance Coupling for 5G Wireless Power Transfer Applications*

Saidatul Izyanie Kamarudin (University Putra Malaysia, Malaysia); Alyani Ismail (Universiti Putra Malaysia, Malaysia); Aduwati Sali (UPM, Malaysia); Mohd Yazed Ahmad (University of Malaya & Faculty of Engineering, University of Malaya, Malaysia)

In this paper, 4-coils Magnetic Resonance Coupling (MRC) for 5G Wireless Power Transfer (WPT) applications has been proposed and analyzed. The small resonance 4-coils at 14 GHz frequency with dimension of 6.1 mm x 6.1 mm has been designed on Silicon and Oxide layer substrates to reduce the losses in the system. The 4-coils MRC is simulated in CST software and the efficiency of the system is 61.38% when the distance is at 0.3 mm. The simulation of the design is also being compared with the theoretical calculations in MATLAB and the accuracy of the efficiencies versus distances differential errors are estimated up to 5%.

CME 2

Control and Mechatronic Engineering 2
Room 7

9:00 *Modelling a Customized Mixed Model Assembly Line: A Case Study Using a Water Bottling Plant*

Rangith Baby Kuriakose (University of Technology & Central University of Technology, South Africa); Hermanus Vermaak (Central University of Technology, Free State, South Africa)

Assembly lines have been critical to the successful operation of manufacturing plants. This is mainly attributed to the ability of assembly lines to adjust to the needs of the industry at any given time. Therefore, it is imperative that assembly lines adjust to the latest industrial revolution, being Industry 4.0 or the era of smart manufacturing. A standout feature of Industry 4.0, is how it has changed the way products are ordered. Industries are moving from a conventional make-to-stock approach to a make-to-order approach. This paper looks at the how a customized ordering system can be modelled for a mixed model assembly line. The research is based on a case study using a water bottling plant which can can manufacture 500 ml and 750 ml bottles of water. The economic viability and a preliminary model for the project was done and documented previously. This paper is structured such that it initially provides an introduction to the research. Secondly, it looks the overview of the previous model and its limitations. Thridly, the paper shows how model has been developed in MATLAB to introduce customized ordering. Finally, the results obtained from the simulation are shown. The primary aim of this research is to develop a MATLAB model for customizing the input of a water bottling plant. This model can then be used to optimize the time to manufacture water bottles and contribute to the broader research area of Assembly Line Balancing.

9:20 *Parameters Optimization of Surface Grinding Process with Particles Swarm Optimization, Gravitational Search, and Sine Cosine Algorithms: A Comparative Analysis*

Teh Muy Shin (Universiti Malaysia Pahang & Faculty of Manufacturing Engineering, Malaysia); Asrul Adam (Universiti Malaysia Pahang, Malaysia); Amar Faiz Zainal Abidin (Universti Teknikal Malaysia Melaka, Malaysia)

The selection of parameters in grinding process remains as a crucial role to guarantee that the machined product quality is at the minimum production cost and maximum production rate. Therefore, it is required to utilize more advance and effective optimization methods to obtain the optimum parameters and resulting an improvement on the grinding performance. In this paper, three optimization algorithms which are particle swarm optimization (PSO), gravitational search, and Sine Cosine algorithms are employed to optimize the grinding process parameters that may either reduce the cost, increase the productivity or obtain the finest surface finish and resulting a higher grinding process performance. The efficiency of the three algorithms are evaluated and compared with previous results obtained by other optimization methods on similar studies. The experimental results showed that PSO algorithm achieves better optimization performance in the aspect of convergence rate and accuracy of best solution. Whereas in the comparison of results of previous researchers, the obtained result of PSO proves that it is efficient in solving the complicated mathematical model of surface grinding process with different conditions.

9:40 *A Review on Graph Search Algorithms for Optimal Energy Efficient Path Planning for an Unmanned Air Vehicle*

Sanjoy Kumar Debnath (Universiti Tun Hussein Onn Malaysia, Malaysia); Rosli Omar (Universiti Tun Hussein Onn Malaysia (UTHM), Malaysia); Nor Badariyah Abdul Latip (Universiti Tun Hussein Onn Malaysia, Malaysia); Shasha Shelyna and Elia Nadira (University Tun Hussien Onn Malaysia, Malaysia); Che Ku Nor Che Ku Melor (Universiti Tun Hussein Onn Malaysia, Malaysia); Tapan Kumar Chakraborty (University of Asia Pacific, Bangladesh); Elango Natarajan (UCSI University, Malaysia)

Unmanned Air Vehicle (UAV) has attracted attention in recent years in conducting missions for longer time with higher levels of autonomy. For the enhanced autonomous characteristic of UAV, path planning is one of the crucial issues. Current researches on the graph search algorithms under combinatorial method are mainly reviewed in this paper by keeping focus on the comprehensive surveys of its properties for path planning. The outcome is a pen picture of their assumptions and drawbacks.

10:00 *Real Time Object Customization in CAD System via Visual Basic Programming*

Muhammed Nafis Osman Zahid (Univerisiti Malaysia Pahang & Malaysia, Malaysia); Zainal Fahmi (University of Malaysia Pahang, Malaysia)

This paper outlines a development of graphical user interface (GUI) for real time object customization in computer aided design (CAD) by utilizing Visual Basic (VB) programming language in NX10 CAD software. Major works involve development of the object customization tool in the form of new GUI which provides a set of editable parameters section. A customized graphical user interface (GUI) was developed to simplify the manual customization process. In order to develop the program, customization work is translated into programming codes via advanced tool available in the NX10. The recorded code translated into visual basic script files and then is modified to create a functional GUI. The results indicate that the developed program is capable to customize the CAD model with minimum drawing steps and time.

ECE 3

Electronic and Computer Engineering 3
Room 5

9:00 *On-Chip Rectifier Recharges Energy to Radio Frequency Energy Harvesting Applications*

Mohammed Alselwi (UTeM & Cadence, Malaysia); Yan Chiew Wong (Universiti Teknikal Malaysia Melaka, Malaysia); Zul Atfyi Fauzan Mohammed Napiah (Universiti Teknikal Malaysia Melaka (UTeM) & Centre for Telecommunication Research & Innovation (CeTRI), Malaysia)

This Paper presents review about on-chip rectifier, as well as design and simulation of conventional differential cross-connect rectifier (DCCR) with rectifier input impedance and impedance matching network at input power of -16dBm and operating frequencies of 2.44GHz and 28GHz and fixed load of 60K

9:20 *Simulation Study of Single Event Effects (SEE) Sensitivity on Power MOSFET with Single Heavy Ion Radiation*

Erman Yahya and Ramani Kannan (Universiti Teknologi Petronas, Malaysia); Lee Lini (Multimedia University Cyberjaya, Malaysia); Saranya Krishnamurthy (Universiti Teknologi PETRONAS, Malaysia)

High frequency and high voltage semiconductor device are key components for advanced power electronic system that require fast switching speed. Power Metal Oxide Semiconductor Field Effect Transistor (MOSFET) is the most famous electronic device that used in many power electronic system. However, the application such as space borne, military and communication system needs Power MOSFET to withstand at radiation environments. This is very challenging for the engineer to make this device continuously operated without

changing its electrical behavior after exposure to the radiation. Therefore, the main objective of this study is to investigate the Single Event Effect (SEE) sensitivity by using Heavy Ion Radiation on the Power MOSFET. A simulation study using Sentaurus Synopsys TCAD software will carry on in this research for the process and device simulation.

9:40 *Humidity Effect on Electrical Properties of Graphene Oxide Back-to-Back Schottky Diode*

Shaharin Fadzli Bin Abd Rahman (Universiti Teknologi Malaysia, Malaysia); Nurul Anati Salleh (Faculty of Science, Universiti Teknologi Malaysia, UTM Johor Bahru, Johor, Malaysia); Mastura Shafinaz Zainal Abidin and Amirjan Nawabjan (Universiti Teknologi Malaysia, Malaysia)

A Schottky diode-based sensor is a promising structure for high sensitive and low power sensor. This paper investigates a device called back-to-back Schottky diode (BBSD) for humidity sensing operation. The BBSD provides simpler device configuration that can be fabricated using less complicated process. The current-voltage characteristic of the fabricated BBSD was measured at different relative humidity. From the obtained characteristics, series resistance, barrier height and ideality factor was analyzed. The current of the device increased at higher humidity level. The current increase was associated to the decrease of series resistance, barrier height and ideality factor. When humidity decreased from 11 % to 97%, the Barrier height showed reduction of 0.1 eV. The barrier height reduction was explained by considering electric field-induced reduction of graphene oxide. The observed result confirmed the device feasibility as promising simple and low cost humidity sensor.

10:00 *Graphene as Charge Storage Layer in Floating Gate Flash Memory: Comparison Between N-Channel and P-Channel*

Muhammad Hilman Ahmad, Nurul Ezaila Alias, Afiq Hamzah, Razali Ismail, Zaharah Johari, Mastura Shafinaz Zainal Abidin and Norlina Paraman (Universiti Teknologi Malaysia, Malaysia)

The aim of this study is to investigate the memory performances of graphene as charge storage layer in floating gate of n-channel and p-channel flash memory using Silvaco ATLAS TCAD Tools. The simulation work initially is to validate the experimental work with the simulation and then determine the performance of n-channel and p-channel in term of memory window, P/E characteristics and data retention. The memory window for n-channel and p-channel flash memory cell are 15.4V and 15.6V, respectively, at ±20V P/E voltage. The data retention for n-channel flash memory cell is retained by 75% (from 15.4V to 11.6V) and whereas for p-channel flash memory cell is retained by 80% (from 15.6V to 12.5V) after 10 years of -3/3V gate stress. P-channel flash memory cell shows better data retention compared to n-channel flash memory.

10:20 *Reverse Biased NCG/p-Si Schottky Diode Sensor*

Azfar Abid Nawawi (Faculty of Electrical Engineering, Universiti Teknologi Malaysia (UTM), Malaysia); Suhana Mohamed Sultan (Faculty of Electrical Engineering, Universiti Teknologi Malaysia & University of Southampton, Malaysia); Shaharin Fadzli Bin Abd Rahman and Puspa Inayat Khalid (Universiti Teknologi Malaysia, Malaysia); Suan Hui Pu (University of Southampton Malaysia Campus, Malaysia)

An investigation on the effect of the reverse biased operation of NCG/p-Si Schottky contact during methane gas exposure at room temperature has been presented. The experimental results show the larger current shift at the reverse bias operation, compared to the forward bias by exposing to methane gas. This can be attributed to the adsorption of methane gas into the metal surface layer and produces a negative charge at the junction, thus reduces the barrier height of the device. The reverse barrier height was calculated under the reverse bias condition, demonstrated the value decreased from 0.58-0.53eV towards a higher concentration of methane gas. The Schottky junction also affected by the increase in a free carrier when exposure to the reducing gas such as methane. Raman spectra are reported to be detected at G, D and 2D band with the grain size 1.913nm to exhibit single crystallite graphite properties. The results correlate well with the 3D AFM scans reveal the RMS surface roughness of 1.1 to 2.8nm.

ECE 4

Electronic and Computer Engineering 4
Room 6

9:00 *Anomaly Detection for Elderly In-home Activity Monitoring*

Soon-Chang Poh, Yi-Fei Tan, Soon-Nyean Cheong, Chee Pun Ooi and Wooi Haw Tan (Multimedia University, Malaysia)

The world population of the elderly is expected to have a continuous growth and the number of elderly living in solitude is also expected to increase in the coming years. As our health decline with age, early detection of possible deterioration in health becomes important. Behavioral changes in in-home activities can be used as an indicator of health decline. For example, changes in routine of in-home activities. Past research mainly focused on detecting anomalies in routine of each type of in-home activities individually. In this paper, an anomaly detection model to detect changes in routine of in-home activities collectively for a day is proposed. The experiment was evaluated with an existing public dataset. The experimental results demonstrated that the anomaly detection model performed well on unseen testing data with an accuracy of 94.44%.

9:20 *A Simulation Study of Excitation Coil Design in Single-sided MPI Scanner for Human Body Application*

Nurmiza Othman, Muhamad Fikri Shahkhirin Ibrahim and Wan Nurshazwani Wan Zakaria (Universiti Tun Hussein Onn Malaysia, Malaysia); Mohd Razali Md Tomari (University Tun Hussein Onn Malaysia, Malaysia); Md Nor Ramdon Bin Baharomand Luqman Hakim (Universiti Tun Hussein Onn Malaysia, Malaysia)

Magnetic particle imaging (MPI) is a tomographic imaging method introduced for three-dimensional (3D) imaging of human body. It has experienced a rapid development with some potential applications such as cell labelling, magnetic hyperthermia, and last but not least the sentinel lymph node imaging. The invention of an MPI system involves three important elements: tracer development using magnetic nanoparticles (MNPs), hardware realization (scanner using excitation and pickup coils), and image reconstruction optimization. The combination of these elements will produce a high quality of 3D image taken from any biological tissue in the human body. A good image can be obtained after the reconstruction process of the secondary magnetic field from the magnetized MNPs that are injected into human body. Therefore, an adequate strength and homogeneous magnetic field from an excitation coil is needed to enhance the quality of that secondary signal. Unfortunately, the complex surface topography of human body makes it harder for the scanning process to be done and affect the reconstruction image quality to obtain the 3D information of human body. Furthermore, physical properties of an excitation coil also influence the strength and the homogeneity of the magnetic field generation at the MNPs trapped under the body surface. Therefore, this work focused on finding alternative design of the excitation coil in single sided MPI scanner to produce up to a few mT with high homogeneity of magnetic field distribution in the MNPs. Design and simulation were carried out by using an electromagnetic field simulation software, Ansys Maxwell. Physical properties such as type of material, diameter, and shape were varied and modeled to find the suitable parameter of the excitation coil. Then, several arrangement of coil on xy plane were also selected and simulated to find the optimum coil composition that can produce the targeted field at the varied depth of 10 mm to 30 mm under the excitation coil. The significant contribution from this work is several alternative designs of excitation coil with strong and homogeneous magnetic field generation can be proposed especially to obtain a single sided MPI scanner for human body application.

9:40 *Obfuscated Computer Virus Detection Using Machine Learning Algorithm*

Ismahani Ismail and Tan Hui Xin (Universiti Teknologi Malaysia, Malaysia); Ban Khammas (Al Nahrian University, Iraq)

Nowadays, computer virus attacks are getting very advanced. New obfuscated computer virus created by computer virus writers will generate a new shape of computer virus automatically for every single iteration and download. This constantly evolving computer virus has caused significant threat to information security of computer users, organizations and even government. However, signature based detection technique which is used by the conventional anti-computer virus software in the market fails to identify it as signatures are unavailable. This research proposed an alternative approach to the traditional signature based detection method and investigated the use of machine learning technique for obfuscated computer virus detection. In this work, text strings are used and have been extracted from virus program codes as the features to generate a suitable classifier model that can correctly classify obfuscated virus files. Text string feature is used as it is informative and potentially only use small amount of memory space. Results show that unknown files can be correctly classified with 99.5% accuracy using SMO classifier model. Thus, it is believed that current computer virus defense can be strengthening through machine learning approach.

10:00 *Machine Learning Approaches for Land-Use Images Classification*

Hela Elmannai (Princess Nourah University, KSA); Amina Salhi (Princess Nourah University, KSA, Saudi Arabia); Monia Hamdi (Gabes University, Tunisia); Mohamed Sliti (Institut Superieur des Etudes Technologiques de Rades, Tunisia)

Land cover classification has interested recent works especially for deforestation, urban are monitoring and agricultural land use. Moreover, learning machine has proven their robustness for complex problem analysis and resolution. The presented paper deals with the land-use scene recognition on very high-resolution remote sensing imagery. We proposed a new framework based on using machine learning classifiers. The method starts by feature extraction. Then, the classification stage is processed by three learning machine algorithms. Finally, the classifiers results is performed by majority vote algorithm. Experimentation results show that the proposed method provides good accuracy and trustable tool for land use image identification.

10:20 *The Segmentation Analysis of Retinal Image Based on K-Means Algorithm for Computer-Aided Diagnosis of Hypertensive Retinopathy*

Wiharto Wiharto (Universitas Sebelas Maret, Indonesia); E Suryani (University of Sebelas Maret, Indonesia)

Computer-aided diagnosis (CAD) of hypertensive retinopathy is performed by analyzing the retinal image. The analysis is carried out in several stages, one of which is image segmentation. The segmentation carried out so far generally uses a region-based and threshold-based approach. There is not yet a clustering-based approach, and there has been no previous analysis of why clustering-based is not yet widely used. This study aims to conduct clustering-based Segmentation analysis, specifically k-means clustering in hypertensive retinopathy CAD. The research method used is divided into four stages, namely preprocessing, segmentation, feature extraction using fractal dimensions, and statistical analysis for classification. Testing is done using the DRIVE and STARE datasets. Statistical test results showed that the number of clusters 3 and 5 was able to give a significant fractal dimension difference between normal and hypertensive retinopathy.

EPE 2

Electric Power Engineering 2
Room 4

9:00 *Assessment of Capacity Benefit Margin Using Demand Side Management Approach*

Olatunji Obalowu Mohammed (Universiti Teknologi Malaysia, Malaysia); Mohd Wazir Mustafa (University of Technology Malaysia, Malaysia); Daw Mohammed and Sani Salisu (Universiti Teknologi Malaysia, Malaysia); Nabila Ahmad Rufa'i (Bayero University Kano, Nigeria)

For sustainable power supply reliability, utility usually reserves some amount of reserve capacity to mitigate the effect of generation outage or unexpected increase in demand. In a situation where generation outage or an unplanned increase in demand does not occur, this reserve capacity is termed as surplus. In order to reduce this unused capacity for efficient power system operation, utilities commonly reserve some amount of tie-line capacity between interconnected areas to have access to external supply from other areas in case of emergency. This reserved tie-line capacity is called capacity benefit margin. In this paper a method of computing interarea tie-line capacity benefit margin is employed, the sensitivity of capacity benefit margin support from other areas to the increase in the load of one area is investigated, and finally demand side management is proposed to improve the capacity benefit margin support from other areas using the flexibility of demand side management. The modified 24-bus IEEE reliability test system is employed for the verification of the approach.

9:20 *A Framework for Curbing Electricity Theft Based on Universal Anomaly Detection*

Abdulrahaman Okino Otuoze (Universiti Teknologi Malaysia, Malaysia & University of Ilorin, Ilorin, Nigeria); Mohd Wazir Mustafa (University of Technology Malaysia, Malaysia); Ibim Sofimieari (Universiti Teknologi Malaysia, Malaysia); Abdulhakeem Mohd Dobi (Universiti Teknologi Malaysia, Malaysia & Waziri Umaru Federal Polytechnic, Nigeria); Aliyu Hamza Sule (Universiti Teknologi Malaysia, Malaysia & Hassan Usman Katsina Polytechnic, Nigeria); Abiodun E Abioye(Universiti Teknologi, Malaysia); Muhammad Saeed (University of Technology Malaysia, Malaysia)

Electricity theft has caused huge losses over the globe and the trend of its perpetuation constantly evolve as smart technologies such as smart meters are being deployed. Although the smart meters have come under some attacks, they provide sufficient data which can be analysed by an intelligent strategy for effective monitoring and detection of compromised situations. So many techniques have been employed, but satisfactory result is yet to be obtained for a real-time detection of this electrical fraud. This work suggests a framework, Universal Anomaly Detection (UAD) aimed at achieving a real-time detection. The real-time detection is to signal any anomaly in the energy consumption pattern, date and time signatures or any network traffic parameter being monitored. To classify the data based on normal and abnormal behaviour, Lempel-Ziv universal compression algorithm is suggested for probability assignments of the monitored data. This framework can learn abnormal behaviours of smart meter data and give alerts during any detected anomaly based on deviation from this probability.

9:40 *Conceptual Study of the Pool Based Market Model in Malaysia Electricity Supply Industry*

Zuraidah Ngadiron and Nur Hanis Mohammad Radzi (Universiti Tun Hussein Onn Malaysia, Malaysia); Mohammad Yusri Hassan (University of Technology Malaysia(UTM), Malaysia)

The objective of this paper is to address the economic benefits in term of generation revenue and demand payment for the pool based market model in Malaysia electricity supply industry (MESI). In pool market model, there are issues on the benefit of the generators such as too high system marginal price (SMP) during peak demand and no revenue during low demand. Therefore, conceptual study for two bus test system in MESI involving four generators around Peninsular Malaysia is conducted to perform the economic analysis in term of generation revenue and demand assessment considering existing single buyer model and pool based market model, i.e., pool model, spot market model and the proposed model, in order to identify which market model is superior. As a result, the proposed model managed to decrease the demand payment as it is proportional to generation revenue, even though the generation revenue is at intermediate value and succeed to increase the low and medium generator's revenue.

10:00 *Integration of Time of Use (TOU) Tariff in Net Energy Metering (NEM) Scheme for Electricity Customers*

Md Pauzi Abdullah and Abdul Hafiz Razali (Universiti Teknologi Malaysia, Malaysia); Mohammad Yusri Hassan (University of Technology Malaysia(UTM), Malaysia); Dalila Mat Said (Universiti Teknologi Malaysia, Malaysia); Faridah Hussin(University Technology of Malaysia, Malaysia)

The introduction of NEM scheme in Malaysia seen as an improvement from the previous FIT scheme. However, the current NEM scheme unable to benefit the small consumer of residents. Only the large resident which consume great amount of energy will benefited from the scheme. Therefore, the proposed TOU-NEM pricing scheme will be simulated and tested for small, medium and large residents. The results show that the proposed TOU-NEM scheme is more profitable for small, medium and large in term of electricity bill saving compared to NEM scheme and existing tariff. Therefore, the proposed TOU-NEM scheme will benefiting for small, medium and large residents to install the solar panel.

Thursday, November 29 10:40 - 11:00

Morning Break

Thursday, November 29 11:00 - 12:40

CE 4

Communication Engineering 4
Room: Room1

11:00 *User Clustering and Resource Allocation in Downlink CoMP with NOMA*

Norshidah Katiran, Shaharil Mohd Shah, Noorsaliza Abdullah, Aimi Syamimi Ab Ghafar and Faiz Asraf Saparudin (Universiti Tun Hussein Onn Malaysia, Malaysia)

In coordinated multipoint (CoMP) system, the cell-edge performance is improved by minimizing inter-cell interference (ICI) through coordination of resources. Additionally, the non-orthogonal multiple access (NOMA) has been introduced as a promising candidate to further enhance the throughput of next generation wireless communication systems. NOMA allows multiple users to access the wireless channel in the same bandwidth simultaneously, however at different transmit power. In joint transmission NOMA in CoMP (JT-NOMA-CoMP), multiple cells jointly transmit data to users using the same time-frequency resources, which significantly improves the system performance. In this paper, we present a low-complexity user clustering and resource allocation strategy in downlink JP-NOMA-CoMP system with multiple antenna. Based on computer simulation, we show that the proposed approach outperforms the conventional JP-OMA-CoMP and single antenna JP-NOMA-CoMP in terms of achievable sum rate.

11:20 *Pilot Reuse Sequences in Downlink Multi-cells to Improve Data Rates in Massive MIMO System*

Adeeb Salh and Lukman Audah (Universiti Tun Hussein Onn Malaysia, Malaysia); Nor Shahida Mohd Shah (Universiti Tun Hussein Onn Malaysia (UTHM), Malaysia); Shipun Anuar Hamzah (Universiti Tun Hussein Onn Malaysia & Faculty pf Eletrical and Electronic Engineering (FKEE), Malaysia)

Due to the exponential growth in demand for high data rate transmission to active users (UEs) in fifth generation (5G) wireless cellular networks, focus there has been a particular research focus on new techniques that achievable high data rate by suppressing interference between neighboring cells and the analysis of cellular networks that use hundreds of antennas in an array at a base station to assist tens or hundreds of users in the same time-frequency resource. Channel estimation is crucial in massive multiple-input-multiple-output (MIMO) systems; thus, in this paper, we propose that system performance can be improved by using perfect channel estimation and reducing effective interference with pilot reuse sequences that mitigate strong pilot contamination based on the knowledge of large-scale fading coefficients. We derived the lower bounds on the achievable data rate in downlink by analyzing the performance of the zero-forcing (ZF) precoding method and derive the signal-to-interference noise ratio (SINR) to mitigate interference between neighboring cells. From the simulation results, the large pilot reuse sequences improved the achievable data rate and provided better estimation for a channel. When the number of users is large, the interference between neighboring cells can be suppressed by using orthogonal pilot reuse sequences.

11:40 *Implementation of Deep Learning Based Method for Optimizing Spatial Diversity MIMO Communication*

Mahdin Rohmatillah (University of Brawijaya, Indonesia); Sholeh Hadi Pramono (Universitas Brawijaya & Engineering Faculty, Indonesia); Rifa Asyari (Universitas Islam Indonesia, Indonesia)

As an alternative solution of the isuue trade-off phenomenon between performance and computational complexity always become the hugest dilemma suffered by researchers, this research proposes an optimization in both of spatial diversity MIMO communication system using end-to-end learning based model, specifically, it adapts autoencoder model. Two models are introduced in this research which each of them address a problem about data detection task and channel estimation task that has not been addressed in the previous research. The proposed models were evaluated in one of the most common channel impairment which is Rayleigh fading with additional Additive White Gaussian Noise (AWGN) and compared to the standard Alamouti scheme. The results show that these deep learning based models for MIMO communication system result in very promising results by outperforming the baseline methods. In perfect CSIR (Channel State Information in Receiver side) case, the proposed models achieve BER nearly (10)^(-5) at SNR 22.5 dB. While in channel estimation case, the proposed models can exceed the baseline performance even by only transmitting 2 pilots.

12:00 *On the Impact of Routing and Network Size for Wireless Network-on-Chip Performance*

Asrani Lit (Universiti Malaysia Sarawak (UNIMAS), Malaysia); Mohd Shahrizal Rusli and Muhammad Nadzir Marsono (Universiti Teknologi Malaysia, Malaysia)

Wireless Network-on-Chip or WiNoC is an alternative to traditional planar on-chip networks. On-chip wireless links are utilized to reduce latency between distant nodes due to its capability to communicate with far-away node within a single hop. This paper analyzes the impact of various routing schemes and the effect of WiNoC sizes on network traffic distributions compared to conventional mesh NoC. Radio hubs (4×4) are evenly placed on WiNoC to analyze global average delay, throughput, energy consumption and wireless utilization.

For validation, three various network sizes (8×8, 16×16 and 32×32) of mesh NoC and WiNoC architectures are simulated on cycle-accurate Noxim simulator under numerous traffic load distributions. Simulation results show that WiNoC architecture with the 16×16 network size has better average speedup (~1.2×) and improved network throughputs by 6.36% in non-uniform transpose traffic distribution. However, as the trade-off, WiNoC requires 63% higher energy consumption compared to the classical wired NoC mesh.

CE 5

Communication Engineering 5
Room: Room2

11:00 *UHF Meander Bowtie Antenna for RFID Application*

Norsaidah Muhamad Nadzir (Universiti Teknologi Malaysia & Universiti Teknologi Malaysia, Malaysia); Mohamad Kamal A. Rahim (Universiti Teknologi Malaysia, Malaysia); Farid Zubir (Universiti Teknologi Malaysia & Faculty of Electrical Engineering, Malaysia); Huda A. Majid (Universiti Tun Hussein Onn Malaysia, Malaysia)

This paper describes the development of four different ultra-high frequency (UHF) radio frequency identification (RFID) tag antenna using polycarbonate material or transparent paper as the substrate, aluminum tape, and copper tape as the radiating element. The main advantage of the method is that the materials are easy to obtain where it can be found in any hardware stores or in any general online shop. Plus, the antennas are designed in such a way that a meander line is traced along the shape of a bowtie antenna so that the antenna would operate at UHF band. The results of all four of the tag antenna designs are discussed and compared using Computer Simulation Technology (CST) simulation results and measurement results obtained from a portable Vector Network Analyzer (VNA). Finally, the results show that the UHF RFID tag antennas are able to operate at UHF RFID band.

11:20 *Designs of Rectangular-Shaped Planar Inverted-F Antennas at Mobile Operating Frequencies with Different Ground Plane Techniques*

Norhudah Seman, Nurul Inshirah Mohd Razali and Tien Han Chua (Universiti Teknologi Malaysia, Malaysia)

This article presents the designs of planar inverted-F antennas (PIFAs) at frequencies of 0.835 GHz, 0.9 GHz, 1.8 GHz, 1.9 GHz, 2 GHz, and 2.6 GHz. Initially, the designs of rectangular-shaped PIFAs are determined through the parametric studies concerning the dimensions of the antenna's patch length, shorting plate, ground plane, and substrate. Afterward, rectangular-shaped slots are introduced into radiating element of two antennas that operate at a lower frequency range of less than 1 GHz, to tune the resonant frequency to the respective 0.835 GHz and 0.9 GHz. Different configurations of partial or full ground plane are implemented to improve the reflection coefficient, S11 performance to be below -10 dB in both simulation and measurement. The proposed six PIFAs have gain that are greater than 2 dB with the nearly omnidirectional radiation patterns. All the designs and analyses are performed using the CST Microwave Studio utilizing Rogers 4003C substrate.

11:40 *An Ultrawideband Band-Notched Metamaterial MIMO Antenna with SRR for Wireless Communication Systems*

Murtala Aminu-Baba (Universit Teknologi Malaysia, Malaysia); Mohamad Kamal A. Rahim (Universiti Teknologi Malaysia, Malaysia); Farid Zubir (Universiti Teknologi Malaysia & Faculty of Electrical Engineering, Malaysia); Mohd Fairus Mohd Yusof(Faculty of Electrical Engineering, Universiti Teknologi Malaysia, Malaysia); Noor Asmawati Samsuri (Universiti Teknologi Malaysia, Malaysia); Kabiru Ibrahim Jahun (ATBU, Nigeria)

This paper presents a 1 x 1 ultrawideband (UWB) Multiple-Input-Multiple-Output (MIMO) metamaterial antenna, which covers the standard UWB (3 - 10 GHz) bands and WLAN (2.4 GHz) for Wireless Communications Systems (WCS). In the proposed design, a rectangular antenna with metamaterial structure is placed on the ground plane for bandwidth enhancement and multiband generation. Various antenna array configurations of the SRR monopole antenna are studied for MIMO application. It is shown that, Side-by-Side configuration with band reject at WLAN 5.13 GHz that interferes with UWB shows better performance than other configurations. S11 and the S21 are lower than -10 dB and -14.5 dB respectively. The parameter sizes of all the proposed design components are selected through proper optimization and parametric studies.

12:00 *A Wideband Dielectric Resonator Antenna with a Cross Slot Aperture for 5G Communications*

Abinash Gaya and Mohd Haizal Jamaluddin (Universiti Teknologi Malaysia, Malaysia); Muhammad Ramlee Kamarudin (Cranfield University, United Kingdom (Great Britain)); Irfan Ali (Universiti Teknologi Malaysia, Malaysia)

This paper represents about design of a wideband Rectangular Dielectric Resonator antenna. A bandwidth of 2.2 GHz has been achieved using a cross slot aperture in a ground plane for Dielectric Resonator Antenna. The simulated gain value achieved is 6.5dBi. The Rectangular Dielectric Resonator which has been designed in this paper can be used in 5G application frequency band of 24.25-27.5 GHz. The calculated percentage bandwidth is 15.38 %. An optimization of slot dimensions has also mentioned which can help to select a desired impedance match.

CE 6

Communication Engineering 6
Room 3

11:00 *Estimation of Rain Attenuation on Terrestrial Millimeter Wave Links from Raindrop Size Distributions*

Manhal Alhilali, Mustafa Ghanim and Jafri Din (Universiti Teknologi Malaysia, Malaysia); Hong Yin Lam (Universiti Tun Hussein Onn Malaysia, Malaysia)

Attenuation by atmospheric rain is the most significant impairment in millimeter wave frequencies (mmWave). Modern instruments could provide detailed measurements of rain, such as raindrop size distributions (DSDs). The analysis of DSDs could estimate their effects on past or co-located links measurements. This study presents propagation analysis in the mmWave bands using measurements of two terrestrial links working at 26 and 38 GHz carried out in Johor, Malaysia. Statistics obtained have been analyzed in detail to extract any excess attenuation. The DSDs provided by a disdrometer have been used to estimate rain attenuation. The derived results show that the estimation can provide reasonable accuracy after extracting the wet antenna effects and having the advantage of the availability of measurements from various types of equipment.

11:20 *Characterization of Concurrent Ku Band Tropospheric Scintillation and Rain Attenuation in Malaysia*

Ibtihal F Elshami (Collage of Electrical and Electronic Technology Benghazi, Libya); Hong Yin Lam (Universiti Tun Hussein Onn Malaysia, Malaysia); Jafri Din (Universiti Teknologi Malaysia, Malaysia); Ali I Elgayar (UTM, University Technologi Malaysia, Malaysia & College of Electrical and Electronics Technology-Benghazi, Libya)

Tropospheric scintillation can become a significant impairment in satellite communication systems, especially in those with low fade-margin. Moreover, fast amplitude fluctuations due to scintillation are even larger when rain is present on the propagation path. Few studies of scintillation during rain have been reported and the statistical characterization is still not totally clear. This paper presents experimental results on the relationship between scintillation and rain attenuation obtained from Johor Bahru, Malaysia, based on a one-year Ku-band propagation measurement. The power spectral analysis has been carried out to determine required cut-off frequency of filtering to separate out rain attenuation and scintillation effects. The results can provide significant information on the fluctuations of wet scintillation at Ku-band earth space link in tropical regions.

11:40 *Wireless Network Planning Methodology for Rural Area in Indonesia*

Nazmia Kurniawati and Achmad Affandi (Institut Teknologi Sepuluh Nopember, Indonesia); Istas Pratomo (Institut Teknologi Sepuluh Nopember Surabaya, Indonesia)

Wireless communication has been implemented widely in Indonesia. However, the planning methodology hasn't been intensively studied. In this paper, we proposed a method for wireless network planning in the Indonesian rural area. Our proposed method consists of ten steps of work that focusses on the ease of the implementation and the application of standard made by the Indonesian government.

12:00 *Rain Attenuation in Broadband Satellite Service and Worst Month Rain Analysis for Abuja Nigeria*

Abubakar Idrissa (Universiti Teknologi Malaysia, Malaysia & Nigerian Communications Satellite Ltd, Abuja, unknown); Jafri Din (Universiti Teknologi Malaysia, Malaysia); Hong Yin Lam (Universiti Tun Hussein Onn Malaysia, Malaysia); Manhal Alhilali (Universiti Teknologi Malaysia, Malaysia)

Satellite link design, link margin and services at lower bands of satellite spectrum has been facing the challenges of meeting the demands for higher data rate. Satellite operators and service providers are been compelled to migrate to the use of higher frequencies above 10 GHz. These frequencies on the other hand were discovered to be vulnerable to atmospheric degradation therefore creating another challenge of service availability especially for tropical rain zones of higher rainfall intensities and longer rain event duration. This study seek to evaluate the profile of rain rate and the monthly and annual variability in order to improve the parameters of interest in the satellite propagation. Two yeas rainfall measurement campaign was conducted in Abuja at Nigcomsat-1R ground station with a view to understanding the characteristics of Abuja rain. The location of the site is on latitude 9.06 degree north and longitude 7.48 degree east. Tipping bucket rain gauge was used for point rain rate and 1.8m VSAT antenna was installed to monitor the rain induced attenuation on satellite broadband signal. The results shows a huge variability between month to month as well as annual average between 2016 and 2017. The performance of broadband satellite service was found to largely to depend on the quality of the carrier power above the system noise rather than bandwidth capacity or the receive signal level.

CME 2

Control and Mechatronic Engineering 2
Room 7

11:00 *Optimization of PID Controller Parameter for Industrial Electro-Hydraulic Actuator System Using PSOGSA*

Mohd Fua'ad Rahmat (Universiti Teknologi Malaysia, Malaysia); Siti Marhainis Othman (University Malaysia Perlis, Malaysia); Mohammed Alqadasi (University Malaysia Perlis (Unimap), Malaysia)

The Electro-hydraulic actuator (EHA) system is known to be extremely nonlinear due to its dynamic characteristics and these existing nonlinearities and uncertainties yield to the constraint in the control of EHA system which influence the position tracking accuracy and affect the occurrences of leakage and friction in the system. The purpose of this work is to develop the mathematical model for industrial electrohydraulic actuator, then to design a controller by PID and optimize the parameters using PSOGSA algorithm. A few controller such as convential PID (CPID) and MRAC also have been designed. The performance of PID, PID-PSOGSA and modern controller MRAC controller will be compared in order to thee determine the most efficient controller Matlab and Simulink have been used in the simulation of the study. Despite all controllers are capable to provide good performance, PID-PSOGSA control methods generates better response compared to PID and MRAC in term of positioning.

11:20 *Remote Tending of Modern Broadcast Transmitters*

Gerino P Mappatao, Isaiah Mari Zebedia Bautista, Joseph Castillo, Marc Kevin Orsos and Mark Aldrine Ribo (De La Salle University, Philippines)

Once broadcast transmitters are put into operation, regulatory bodies in different countries require the equipment to be monitored, data logged and controlled. Normally, transmitter personnel turn ON the transmitter at the start of the broadcasting activities, and turn it OFF at the end of the activities. They also regularly record the transmitter meter readings on output power, voltage and current as long as the transmitter is on-air. These data must be logged and saved for future references. These procedures are done by transmitter personnel manually. With the advent of internet technology, this paper presents a system to remotely monitor, gather and record meter readings, and a provision to control the turning ON/OFF as well as to adjust the output power of a number of digital transmitters. All these procedures are done in one central location. The system was implemented and then tested using a digital television transmitter. Results of the tests show that the developed system is able to perform the functions of a transmitter technician in monitoring, logging and control of broadcast transmitters remotely. With the use of the system, broadcast networks can reduce operating costs in tending their transmitters but still able to comply with the requirements.

11:40 *Modified Fingerprinting Localization Technique of Indoor Positioning System Based on Coordinates*

Rhowel Dellosa (Technological Institute of the Philippines-Quezon City, Philippines); Arnel Fajardo (Manuel L. Quezon University, Philippines); Ruji Medina (Technological Institute of Technology, Philippines)

The fingerprinting localization technique is the most commonly used localization technique of indoor positioning system. It is used by several technologies for short and long range position estimation like wireless fidelity and radio frequency. There are several schemes used to estimate location for indoor environment but the drawbacks resulted to complexity issues. These drawbacks have negative effects on the location estimation. In order to address these drawbacks, the paper attempted to explore the fingerprinting localization technique for location estimation of indoor environment that focuses on position estimation. Results showed that the simplicity of the design of position estimation without compromising the functionality of the operations was observed with 100% accuracy on position estimation.

12:00 *A New Technique to Reduce Overshoot in Pneumatic Actuator Positioning System*

Mohd Fua'ad Rahmat (Universiti Teknologi Malaysia, Malaysia); Siti Fatimah Sulaiman (Universiti Teknikal Malaysia Melaka, Malaysia); Ahmad `Athif Mohd Faudzi (Universiti Teknologi Malaysia, Malaysia); Khairuddin Osman (Universiti Teknikal Malaysia Melaka, Malaysia)

This paper presents a new approach for improving the performance of the pneumatic positioning system by incorporating a nonlinear gain function with observer system. The effectiveness of the proposed technique has been evaluated in order to reduce the overshoot in the system's response, which will ensure the accurate and precise position of the pneumatic cylinder stroke. System identification technique has been employed to represent the pneumatic system, while a model predictive control (MPC) with the observer system has been employed as the main controller in order to control the positioning of the system. The nonlinear gain function has been incorporated with the control strategy due to its ability to compensate nonlinearities and uncertainties inherent in the parameters of the system. Two cases of control signals (unconstrained and constrained) have been considered and employed in this study. Simulation test based on Matlab/Simulink indicated a reduction in overshoot of the system response for both unconstrained and constrained cases due to additional nonlinear gain function in the strategy. Furthermore, remarkable enhancement was observed in effectiveness of this function while incorporated in constrained case, when this new strategy successfully improved the transient response in the pneumatic positioning system.

ECE 3

Electronic and Computer Engineering 3
Room 5

11:00 *An Open Source LoRa Based Vehicle Tracking System*

Norhafizah Ramli and Anuar Ahmad (Universiti Teknologi Malaysia, Malaysia); Ivin Amri Musliman (UTM, Malaysia); Muhammad Mun'im A Zabidi (Universiti Teknologi Malaysia, Malaysia)

This work describes an open source tracking system which determines the location and speed of a vehicle in real-time. Further offline analytics are possible. The system is inspired by the need to track tourist boats in Kilim Karst Geoforest Park, Malaysia. Boats which travel too fast generate wakes which are suspected to cause ecological damage. In this work, geolocation data is provided by Arduino based transponders with Global Positioning System (GPS). Transponders periodically transmit location and speed data using LoRa through a gateway to a cloud server. On the server, open source software components implement a Geographical Information System (GIS) to manage the location and speed data for display and further analysis. The resulting prototype performed the required functions as expected.

11:20 *Graphene Field-Effect Transistor Simulation with TCAD on Top-gate Dielectric Influences*

Muhamad Amri Ismail and Khairil Mazwan Mohd Zaini (MIMOS Berhad, Malaysia); Syono Mohd. Ismahadi (Mimos Berhad, Malaysia)

This paper presents the influence of top-gate dielectric material for graphene field-effect transistor (GFET) using TCAD simulation. Apart from silicon-based dielectric that is typically used for top-gate structure, other high-k dielectric materials namely aluminum oxide and hafnium oxide are also involved in the analysis deliberately to improve the electrical properties of the GFET. The unique GFET current-voltage characteristics against several top-gate dielectric thicknesses are also investigated to guide the wafer fabrication engineers during the process optimization stage. The improvement to critical electrical parameters of GFET in terms of higher saturation drain current and greater on/off current ratio shows that the use of high-k dielectric material with very thin oxide layer is absolutely necessary.

11:40 *Evaluating IoT Based Passive Water Catchment Monitoring System Data Acquisition and Analysis*

Mohammad Fadhil Abas (Universiti Malaysia Pahang, Malaysia)

Water quality is the main aspect to determine the quality of aquatic systems. Poor water quality will pose a health risk for people and ecosystems. The old methods such as collecting samples of water manually and testing and analyzing at the lab will cause the time consuming, wastage of manpower and not economical. A system is needed to provide a real-time data for environmental protection and tracking pollution sources. This paper aims to describe how to monitor water quality continuously through IoT platform. Water Quality Catchment Monitoring System was introduced to check and monitor water quality continuously. It features five sensors which are a temperature sensor, light intensity sensor, pH sensor, GPS tracker and Inertia Movement Unit (IMU). IMU is a new feature in the system where the direction of x and y is determined for planning and find out where a water quality problem exists. The system uses a wireless connection to the Internet through the use of the ESP8266 Wi-Fi Shield Module as a connection between Arduino Mega2560 and laptop. The ThingSpeak application acts as an IoT platform used for real-time data monitoring.

12:00 *Adaptive Control of Nonlinear System Based on QFT Application to 3-DOF Flight Control System*

Rounaqul Islam Boby, Khaizuran Abdullah, Ahmad Jusoh, Nagma Parveen and Md Mahmud (International Islamic University Malaysia, Malaysia)

Research on unmanned aerial vehicle (UAV) became popular because of remote flight access and cost-effective solution. To date, researchers have paid significant attention to the control problem of this autonomous 3-degree of freedom (3-DOF) unmanned helicopters. Various control algorithms are investigated and designed for the motion control of the 3DOF helicopter. Three-degree-of-freedom helicopter model configuration presents the same advantages of 3-DOF helicopters along with increased payload capacity, increase stability in hover, manoeuvrability and reduced mechanical complexity. Numerous research institutes have chosen the three-degree-of-freedom as an ideal platform to develop intelligent controllers. In this research paper, we discussed about a hybrid controller, that combined with Adaptive and Quantitative Feedback theory (QFT) controller for the 3-DOF helicopter model. Though research on Adaptive and QFT controller are not a new subject, the first successful single Adaptive aircraft flight control systems have been designed for the U.S. Air Force in Wright Laboratories unmanned research vehicle, Lambda [1]. Previously researcher focused on structured uncertainties associated with controller for the flight conditions theoretically. The development of simulation based design on flight control system response, opened a new dimension for researcher to design physical flight controller for plant parameter uncertainties. At the beginning, our research was to investigates the possibility of developing the QFT combined with Adaptive controller to control a single pitch angle that meets flying quality conditions of automatic flight control. Finally, we successfully designed the hybrid controller that is QFT based adaptive controller for all the three angles.

12:20 *Automatic Smoke Detection System with Favoriot Platform Using Internet of Things (IoT)*

Siat Ling Jong (Universiti Tun Hussein Onn Malaysia, Malaysia); Mohd Alif Suparman (Faculty of Electrical and Electronic Engineering, UTHM, Malaysia)

This paper reports an automatic smoke detector system using Internet of Things (IoT). The proposed system not only able to monitor the smoke condition of a room but also able to alert user and Fire and Rescue Department when certain level of smoke is detected by a MQ-2 sensor via Favoriot platform. Arduino Uno is used in this project to control all the devices and WiFi shield acts as a medium to interconnect devices with the network so that the data from the smoke sensor can be read in the Favoriot platform. In this experiment, the condition of room is tested under several burning materials and the smoke level is recorded. It is found that when the smoke level more than 100 ppm, it may cause to sore eyes, cough and hard breathing that can bring to death. Therefore, the best threshold level of the automatic smoke detector system is at 80 ppm. By using this system, the user able to take preliminary rescue action to save people and avoid fire breaks out.

ECE 4

Electronic and Computer Engineering 4
Room 6

11:00 *Portable Cardiac Self-Stress Test Device Development Based on Metabolic Equivalent (METS)*

Whomaira Abdul Samad, Mohd Afzan Othman, Norlaili Mat Safri and Mohd Azhar Abdul Razak (Universiti Teknologi Malaysia, Malaysia)

Cardiovascular disease (CVD) is the main cause of death worldwide and the type varies depending on symptom and causes. There are several procedures to determine the type of CVD such as blood test, holter monitoring, cardiac stress test and many more. Cardiac stress test is a procedure to exert pressure on the heart by doing physical activities to determine heart functionality and abnormal heart activity. It is done to gather information on heart condition supported by evidence in the form of electrocardiogram (ECG) signal. However, patients with heart problem will have to take turns to run the test due to limited access to the equipment especially in government hospital. Therefore, this paper proposed the development of cardiac self-stress test device to provide a pre-diagnosis result based on metabolic equivalent (METS) value supported by ECG signal. The device named "i-STress device" is a stand-alone device integrating the use of software application and hardware. The software was built by using MIT App Inventor 2 and the hardware built based on Arduino 101 and Sparkfun Heart Monitor AD 8232 and the test result saved in SD card. The device will be useful to sort out patient's case priority as well as providing pre-diagnosis result before conducting a real cardiac stress test.

11:20 *Analysis of Surface Electromyography for Hand Gesture Classification*

Najla Ab Majid (University of Technology Malaysia, Malaysia); Noraini Zakaria (Universiti Teknologi Malaysia, Malaysia); Sharvin Ramachandran and Norlaili Mat Safri (University of Technology Malaysia, Malaysia)

Electromyography (EMG) is the measure of electrical activity produced by skeletal muscle. It is useful in prosthetic and rehabilitation technology as well as ability to handle electronic devices and robotics. If the EMG signal from the body especially hand movement can be apprehend, better value for people all around the world can be provided. Furthermore, it can be used to control smartphone and be integrated with wearable technology. Another interesting application of this technology is in sign language recognition which is able to assist many disabled people in their daily lives. In this paper, hand gesture signals are acquired, extracted, analyzed and classified. The EMG data from hand gesture which are rock, paper and scissors managed to be extracted. We use time domain feature to classified using Principal Componen Analysis and regression tree. The result were highly accurate with 72.59% and 80.85% for PCA and regression tree respectively.

11:40 *Emotion Recognition Feature Selection Using End-part Segmented Speech on Energy Feature*

Noor Aina and Md Sah Salam (Universiti Teknologi Malaysia, Malaysia)

The accuracy of human emotional detection is crucial in the industry to ensure effective conversations and messages delivery. The process involved in identifying emotions must be carried out properly and using a method that guarantees high level of emotional recognition. Energy feature is said to be a prosodic information encoder and there is still a study on energy use in speech prosody and it motivate us to run an experiment on energy features. We have conducted two sets of studies: 1) whether local or global features that contribute most to emotional recognition and 2) the effect of the end-part segment length towards emotion recognition accuracy using 2 types of segmentation approach. This paper will discussed about Absolute Time Intervals at Relative Positions (ATIR) segmentation approach and global ATIR (GATIR) using end-part segmented global energy feature extracted from Berlin Emotional Speech Database (EMO-DB). The addition of utterance-based feature (GTI) to ATIR segmentation somewhat contributes to increase the accuracy by 5% up to 8% and conclude that GATIR outperformed ATIR segmentation approached in term of its higher recognition rate.

12:00 *Model-based Method in Assessing Breathing Effort in Mechanically Ventilated Patients in Malaysian ICU Hospital*

Nor Salwa Damanhuri (Universiti Teknologi MARA (UiTM) Pulau Pinang, Malaysia); J. Geoffrey Chase (University of Canterbury, New Zealand); Chiew Yeong Shiong (Monash University Malaysia, Malaysia); Azrina Ralib and Mohd Basri Mat Nor(International Islamic University Malaysia, Malaysia); Nor Azlan Othman (Universiti Teknologi MARA (UiTM) Pulau Pinang, Malaysia); Paul Docherty (University of

Canterbury, New Zealand); Noor Najwa Noor Ariffin (Universiti Teknologi MARA (UiTM) Pulau Pinang, Malaysia)

Patients with Acute Respiratory Distress Syndrome (ARDS) required mechanical ventilation (MV) for breathing support. However, some MV patients encountered spontaneous breathing (SB) efforts while fully sedated which can obscure the true underlying respiratory mechanics of these patients. Thus, pressure reconstruction method is required to reconstruct the missing pressure and calculate the breathing effort that produced by the patients without additional clinical protocols or invasive procedure. In this paper, results of spontaneous breathing effort in Malaysian critically-ill patients adopting the developed pressure reconstruction model are presented. By using the pressure reconstruction model, the SB affected pressure waveform is reconstructed to approximate true respiratory mechanics and quantifies the SB effort. The SB breathing efforts were computed and compared with the results from Christchurch Hospital, New Zealand. The substitute measure of SB effort can be indicated from the difference between the reconstructed and unreconstructed pressure. Results shows that all patients from both cohorts exhibited SB effort with the highest SB effort at 11.48% for Malaysian patient. Overall, the well-developed non-invasive pressure reconstruction method is able to measure the SB effort produced by Malaysian MV patients that help the clinicians in selecting the optimal MV setting. This first non-invasive guidance in selecting the optimal setting of MV in Malaysia is potentially reduced the ICU cost and improve the MV management in Malaysian hospital.

12:20 *Optimization of 16 nm DG-FinFET Using L18 Orthogonal Array of Taguchi Statistical Method*

Fauziyah Salehuddin, Ameer Farhan Roslan, Khairil Ezwan Kaharudin and Anis Suhaila Mohd Zain (Universiti Teknikal Malaysia Melaka, Malaysia); Hanim abdul Razak (UTEM, Malaysia); Hazura Haroon (Universiti Teknikal Malaysia Melaka & Centre for Telecommunications Research Innovations (CETRI), Malaysia); Siti Idris (Universiti Teknikal Malaysia Melaka, Malaysia); Ibrahim Ahmad (Universiti Tenaga Nasional, Malaysia)

The impact of the optimization using Taguchi statistical method towards the electrical properties of a 16 nm double-gate FinFET (DG-FinFET) is investigated and analyzed. The electrical properties that is presented in this paper includes the drive current (ION), leakage current (IOFF), and threshold voltage(VTH) and the aforementioned electrical properties will be influenced by the changes made from six process parameters namely polysilicon doping dose, polysilicon doping tilt, Source/Drain doping dose, Source/Drain doping tilt, VTH doping dose, VTH doping tilt, alongside the consideration of noise factor in gate oxidation temperature and polysilicon oxidation temperature. ATHENA and ATLAS module from Silvaco TCAD is used to perform the respective device simulation and the electrical characterization of the device. The outcome from the following modules are trailed by the Taguchi statistical method to assist the process parameter optimization as well as its design whereby the effectivity of the process parameter with respect to ION and IOFF is selected through the factor effect percentage on Signal-to-noise ratio. The most dominant factor obtained is the polysilicon doping tilt. The ION and IOFF obtained after the optimization are 1634.2 μA/μm and 54.284 pA/μm for which has met the predictions of International Technology Roadmap for Semiconductors (ITRS) 2013.

EPE 2

Electric Power Engineering 2
Room 4

11:00 *Time Series Data Measurement on Electricity Consumption for Selected Domestic Appliances in Typical Terrace House in Malaysia*

Naja Aqilah Hisham and Sheikh Ahmad Zaki Shaikh Salim (Universiti Teknologi Malaysia, Malaysia); Aya Hagishima (Kyushu University, Japan); Nelidya Md. Yusoff (Universiti Teknologi Malaysia, Malaysia); Fitri Yakub (Universiti Teknologi Malaysia & Malaysia-Japan International Institute of Technology, Malaysia)

This paper describes the pattern of electricity consumption from total and selected domestic appliances at typical terrace house in Malaysia. The measured appliances can be classified into four groups on the basis of pattern of use which are 'standby' (TV), 'active' (massage chair, charger of hand phone, laptop and power bank, washing machine, air-conditioners, iron, standing fan, shower heaters, rice cooker, toaster, microwave), 'cold' (refrigerator) and 'cold and hot' (water dispenser). The major contribution of monthly electricity consumption comes from 'cold' appliances that consume 118.8 kWh/month followed by 'active' appliances that consume 87.8 kWh/month and 'cold and hot' appliance with 52.5 kWh/month. 'Standby' appliances shown a small contribution to the total electricity with 0.9 kWh/month. The amount of energy consumed depends on time-of-use, power characteristics of particular appliances as well as occupancy period.

11:20 *Improved Load Flow Formulation for Radial Distribution Networks*

Dahaman Ishak (Universiti Sains Malaysia, Malaysia); Norainon Mohamed (Universiti Malaysia Pahang, Malaysia)

This paper aims to provide an improved load flow formulation for solving load flow problem in radial distribution networks. The improved algorithm is formulated from the basic Kirchoff's voltage law. The proposed method does not need any matrix multiplication, and the voltage equation is derived to compute the voltage at each node. The proposed method is then tested on three different standards of radial distribution networks under different R/X ratio and different loading conditions. The simulation results from the suggested algorithm are also compared with other existing methods. A very good agreement is achieved.

11:40 *Energy Efficiency Index by Considering Number of Occupants: A Study on the Lecture Rooms in a University Building*

Noor Ameera Zakaria (Universiti Teknologi Malaysia, Malaysia); Mohammad Yusri Hassan (University of Technology Malaysia(UTM), Malaysia); Hayati Abdullah and Md Pauzi Abdullah (Universiti Teknologi Malaysia, Malaysia); Faridah Hussin(University Technology of Malaysia, Malaysia); Siti Maherah Hussin, SMH and Nur Najihah Abu Bakar (Universiti Teknologi Malaysia, Malaysia)

The building sector is attributed to approximately 40% of the nation's energy consumption and this accounts for a significant percentage of the nation's energy consumption. For this reason, energy efficiency in buildings has now become an important subject in the national energy scenario. Energy Efficiency Index (EEI) is one of the energy consumption indicators that is widely used in the building sector for measuring energy performance. This index is generally measured based on the energy used per unit of building floor area. However, this index is not able to directly identify other factors affecting energy usage. This paper suggests an Energy Efficiency Index (EEI) for determining the performance of lecturer rooms in a university building. Unlike the conventional EEI, the proposed EEI determines the room's energy usage performance by considering the number of occupants. The study was conducted at the Faculty of Electrical Engineering, Universiti Teknologi Malaysia (UTM) and the results show that the number of occupants significantly influences the energy usage performance of rooms in a university building.

12:00 *Comparison Between Fast Fourier and Discrete Wavelet Transform for Fault Location Identification of Double Circuit Transmission Line*

Faridah Hanim Mohd Noh (Universiti Tun Hussien Onn Malaysia, Malaysia); Rohaiza Hamdan (Universiti Tun Hussein Onn Malaysia, Malaysia); Marlia Morsin (Universiti Tun Hussien Onn Malaysia & Institute of Integrated Engineering (I2E), Malaysia); Mohd Hafiz Abd Jalil Zainuddin and Nor Aira Zambri (Universiti Tun Hussein Onn Malaysia, Malaysia)

The importance of supplying undisturbed electricity keep increasing due to modernization and lifestyle. Any disturbance in the power system may lead to discontinuation and degradation in the power quality. Therefore, detecting fault, fault type and fault location is a major issue in power transmission system in order to ensure reliable power delivery system. This paper will compare two prominent method to estimate the fault location of double circuit transmission line. Those methods are Discrete Wavelet Transform algorithm and Fast Fourier Transform algorithm. Simulations has been carried out in MATLAB/Simulink and a variety of fault has been imposed in order to analyse the capability and accuracy of the fault location detection algorithm. Results obtained portrayed that both algorithms provide good performance in estimating the fault location. However, the maximum percentage error produced by the Discrete Wavelet Transform is only 0.25%, 0.6% lower than maximum error produces by Fast Fourier Transform algorithm. As a conclusion, Discrete Wavelet Transform possess better capability to estimate fault location as compared to Fast Fourier Transform algorithm.

Thursday, November 29 12:40 - 14:00

Lunch

Thursday, November 29 14:00 - 15:40

CE 7

Communication Engineering 8
Room: Room1

14:00 *A Novel Autonomous Wireless Sensor Node for IoT Applications*

Ngan Nguyen (HUST, Vietnam); Quoc Cuong Nguyen (Hanoi University of Science and Technology, Vietnam); Minh Thuy Le (Hanoi University of Science and Technology (HUST) & School of Electrical Engineering (SEE), Vietnam)

A novel wireless sensor network node (WSNN) is presented in this paper where the solar energy harvester system is used as an autonomous power solution for endless battery time life. In this sensor node, the meander-line Inverted-F-Antenna (MIFA) is proposed and integrated in a single -CC2650 chip of Texas Instrument. The simple structure, low cost, compact size, high efficiency and low power consumption are advantages of this single-chip WSNN. The experimental results show that MIFA antenna are promising solutions to enhance communication performance in WSN. In addition, the investigated single-chip WSNN with multi-wireless technologies including Bluetooth Low Energy and Zigbee as well as 6LowPAN is an attractive device for internet of thing (IoT) applications

14:20 *An Energy Efficient Void Avoidance Opportunistic Routing (EEVA-OR) Protocol for Underwater Sensor Networks*

Azlina Kamaruddin and Hafizah Harun (Universiti Teknologi Malaysia, Malaysia); Md Asri Ngadi (Universiti Teknologi Malaysia & UTM, Malaysia)

Underwater sensor network (USN) is an emerging technology due to its numerous applications in aqueous environments. However, limitations of these networks include limited bandwidth, high propagation delays and power constraints. Acoustic communication protocols are used instead as a transport medium. Hence, routing protocols must be designed specifically for USN. Researchers have proposed different USN routing protocols which improves the packet delivery with minimum energy and delay cost. Opportunistic routing offers a promising method to overcome these limitations. The proposed protocol is a novel energy-efficient void avoidance opportunistic routing algorithm for USNs. The protocol deals with the issue of void holes during transmission while reducing energy consumption and keeping the packet delivery ratio at a satisfactory level. To evaluate the performance, we used two common metrics that have been used for routing protocols in USNs; energy consumption and packet delivery ratio. Simulations were carried out in ns2 with Aqua-Sim. The performance of the proposed protocol is compared with the standard VAPR protocols. The comprehensive performance evaluation attests the benefit of EEVA-OR as compared to the mentioned protocol in terms of energy consumption and packet delivery ratio

14:40 *Internet of Things in Strawberry Production: A Review*

Olakunle Elijah (University Teknologi Malaysia, Malaysia); Abdelmoneim Ahmed bakhit (Universiti Teknologi Malaysia & UTM, Malaysia); Tharek Abdul Rahman (Wireless Communication Centre, Malaysia); Siti Fatimah Ausordin, Tien Han Chuaand Rifhan Narrissa Razali (Universiti Teknologi Malaysia, Malaysia)

Strawberry is a widely consumed fruit and cultivated globally but predominantly in cooler temperate zones because of its wealth of nutrients, vitamins and minerals. However, there are several challenging factors faced in the growing of strawberry such as temperature, seasonal production and short shelf life. To overcome some of these challenges, the application of internet of things (IoT) in greenhouse is been used. In this paper, a review of the application of IoT in the greenhouse production of strawberry is presented. This includes a survey of existing literature on production of strawberry, types, method of growing strawberry and the application of IoT. The benefits and challenges of IoT in greenhouse strawberry production is discussed. The review highlights the need for use of low power wide area communication technology in the application of IoT in greenhouse strawberry production especially in tropical regions like Malaysia.

15:00 *IoT-based Smart Irrigation Management and Monitoring System Using Arduino*

Firdaus Kamaruddin, Nik Noordini Nik Abd Malik, Noor Asniza Murad, Nurul Mu'azzah Abdul Latiff and Sharifah Kamilah Syed Yusof (Universiti Teknologi Malaysia, Malaysia); Shipun Anuar Hamzah (Universiti Tun Hussein Onn Malaysia & Faculty pf Eletrical and Electronic Engineering (FKEE), Malaysia)

Plants, flowers and crops are living things around us that makes our earth more productive and beautiful. In order to growth healthy, they need water, light and nutrition from the soil in order to effect cleaning air naturally and produce oxygen to the world. Therefore, a technology that manage to brilliantly control plants watering rate according to its soil moisture and user requirement was proposed in this paper. The developed system included an Internet of Things (IoT) in Wireless Sensor Network (WSN) environment where it manages to manage and monitor the irrigation system either manually or automatically, depending on the user requirement. This proposed system applied Arduino technology and NRF24L01 as the microprocessor and transceiver for the communication channel, respectively. Smart agriculture and smart lifestyle can be developed by implementing this technology for the future work. It will save the budget for hiring employees and prevent from water wastage in daily necessities

CE 8

Communication Engineering 8
Room: Room2

14:00 *Analysis of Wave Propagation for Wireless Implantable Body Area Network Application*

Nur Hidayah Ramli (Universiti Malaysia Perlis & Faculty of Engineering Technology, Malaysia); Haryati Jaafar (Universiti Malaysia Perlis, Malaysia); Lee Yeng Seng (University Malaysia Perlis, Malaysia); O. Hazila (Universiti Malaysia Perlis, Malaysia)

The enhancement technologies of wireless body area network improved the health monitoring system. Previous work have been designed the implantable chip printed antenna at 4.8 GHz. This paper is continuing the investigation where the antenna wave propagation in term of attenuation and polarization were studied. The antenna is implanted in human hand voxel model from CST Microwave Studio Software. The performances of the antenna are evaluated in term of return loss, gain and efficiency. Results show that the rate attenuation for the propagation is approximately 0.16 dB up to 0.42 dB. All the results will be guidelines in designing implantable antennas in futures.

14:20 *Size Miniaturization of Chipless RFID Based Metamaterial Structure Using Modified Complementary Split Ring Resonator*

Mohd Ezwan Jalil, Mohamad Kamal A. Rahim, Osman Bin Ayop and Noor Asmawati Samsuri (Universiti Teknologi Malaysia, Malaysia)

A Chipless RFID based Modified Complementary Split Ring Resonator with Different Width (DW) is designed using PET substrate (ε_r =3, loss tangent = 0.025 at 2 GHz) to miniaturize effective length size of the conventional split ring resonator. The MCSRR structure with WD provides less size about 17% compared with conventional MCSRR structure. The single MCSRR resonator with different width only requires a frequency range of 12 % of CSRR resonator. The slotted MCSRR resonator which located underneath substrate which is connected with transmission lines to measure insertion loss between two ports. The insertion loss value will be used to encode ID information of chipless RFID. The best swapping parameter for encoding ID number information is split gap of both rings compare with other parameters such as spacing between ring and width of ring.

14:40 *Dual Band Low Loss Metamaterial Structure at Millimetre Wave Band*

Bashar Esmail (UTHM, Malaysia); Huda A. Majid (Universiti Tun Hussein Onn Malaysia, Malaysia); Muhammad Faizal Ismail (Universiti Tun Hussein Onn Malaysia & Centre for Diploma Studies, Malaysia); Samsul Haimi Dahlan (Universiti Tun Hussien Onn Malaysia, Malaysia); Zuhairiah Zainal Abidin (Universiti Tun Hussein Onn Malaysia, Malaysia); Mohamad Kamal A. Rahim (Universiti Teknologi Malaysia, Malaysia)

In this paper, dual band modified split square resonator (MSSR) metamaterial (MM) structure was designed and numerically investigated at millimetre wave (mm-wave) frequency range. The proposed structure operated at two resonance frequencies at 28 GHz and 32.54 GHz. The dual-band behaviour of the proposed structure due to the self and mutual coupling between two metallic squares of the structure. Furthermore, The MSRR structure performed very well at both resonance frequencies by providing high transmission coefficient, S21, with a loss of -0.3 dB (0.97 linear scale) at lower resonance frequency at 28 GHz and -0.18 dB (0.98 linear scale) at upper resonance frequency at 32.54 GHz. In this regard, the numerical simulation was conducted to optimize the MSSR structure in such a way that the ratio of effective inductance-to-capacitance (L/C) was raised. As a result, the inherent MM losses were reduced. The robust retrieval algorithm was utilized to reconstruct the refractive index, effective permittivity, and effective permeability and to verify the left-hand property of the proposed structure. The simulation results showed that the MSSR unit cell introduces two regions of the negative refractive index below the lower resonance frequency at 28 GHz and above the upper resonance frequency at 32.54 GHz.

15:00 *Multiband Hairpin-Line Bandpass Filters by Using Metamaterial Complimentary Split Ring Resonator (CSRR)*

Mohd Fairus Mohd Yusof (Faculty of Electrical Engineering, Universiti Teknologi Malaysia, Malaysia); Muhammad Akram Mohd Sobri (Universiti Teknologi Malaysia, Malaysia); Farid Zubir (Universiti Teknologi Malaysia & Faculty of Electrical Engineering, Malaysia); Zaharah Johari (Universiti Teknologi Malaysia, Malaysia)

Telecommunication systems for the new generation have greatly stimulated the demand for multi-band bandpass filters with compact dimensions, low insertion loss, robust, low cost and less complex design. In this paper, a compact multi-band bandpass filter, with the fractional bandwidth of 40% and 20% at resonant frequency 3.5 and 5.5 GHz respectively with the response of Chebyshev passband ripple of 0.1 dB is presented. The design is based on the hairpin-line configuration and metamaterial of CSRR structure. The hairpin-line is used for the compact structure design and easy to fabricate because it has open-circuited ends that require no grounding. While the CSRR structure is easy to design and can provide multi-band without affecting of size and performance of the filter. The simulated results show the dual-band bandpass response with the insertion loss is 0 dB and high attenuation at stopband. The proposed filter provides a compact, low insertion loss, and less complex structure design that are promising candidates in order to meet the demands of the new generation of communication systems.

CE 9

Communication Engineering 9
Room 7

14:00 *A Wireless Precoding Technique for mm-Wave MIMO System Based on SIC-MMSE*

Rounaqul Islam Boby, Khaizuran Abdullah, Ahmad Jusoh, Nagma Parveen and Ani Liza Asnawi (International Islamic University Malaysia, Malaysia)

A communication method is proposed using Minimum Mean Square Error (MMSE) precoding and Successive Interference Cancellation (SIC) technique for millimetre-wave multiple-input multiple-output (mm-Wave MIMO) based wireless communication system. The mm-Wave MIMO technology for wireless communication system is the base potential technology for its high data transfer rate followed by data instruction and low power consumption compared to Long-Term Evolution (LTE). The mm-Wave system is already available in indoor hotspot and Wi-Fi backhaul for its high bandwidth availability and potential lead to rate of numerous Gbps/user. But, in mobile wireless communication system this technique is lagging because the channel faces relative orthogonal coordination and multiple node detection problem while rapid movement of nodes (transmitter and receiver) occur. To improve the conventional mm-wave MIMO nodal detection and coordination performance, the system processes data using symbolized error vector technique for linearization. Then the MMSE precoding detection technique improves the link strength by constantly fitting the channel coefficients based on number of

independent service antennas (M), Signal to Noise Ratio (SNR), Channel Matrix (CM) and mean square errors (MSE). To maintain sequentially encoded user data connectivity and to overcome data loss, SIC method is used in combination with MMSE. MATLAB was used to validate the proposed system performance.

14:20 *Performance Enhancement of a Hybrid Optical CDMA-DWDM System Against ISI and FWM*

Naif Alsowaidi, Tawfig A Eltaif and Mohd Ridzuan Mokhtar (Multimedia University, Malaysia)

A hybrid optical CDMA-DWDM system accommodates 12 optical CDMA users carried by 5 DWDM wavelengths at data rate of 60Gb/s/wavelength with channel spacing of 0.4nm. The four-wave mixing (FWM) effect is minimized by the use of CDMA technology where the energy of a bit is spread over the optical signature sequence code. The multiple access interference (MAI) is reduced due to the good properties of zero cross correlation (ZCC). The benchmark value of BER <10-9 has been achieved for all optical CDMA users at the transmission distance of 105.075km. The results reveal that the inter-symbol interference (ISI) can be mitigated when the interval of optical signature sequence code is squeezed into 25% of the bit duration.

14:40 *Performance Investigation of MD-SAC OCDMA in FSO Communication Using Different Line Codings*

Sholeh Hadi Pramono (Universitas Brawijaya & Engineering Faculty, Indonesia); Mahdin Rohmatillah (University of Brawijaya, Indonesia)

This paper proposes an investigation of the performances of Multi Diagonal Spectral Amplitude Codewords for Optical Code Division Multiple Access (MD-SAC OCDMA) in FSO Communication over various weathers in accordance to Indonesia condition. Those weather are very clear, light rain, medium rain and strong rain which have attenuation 0.19 dB/km, 2 dB/km, 4.6 dB/km and 6.9 dB/km respectively. The developed system consists of 2 subscribers which have wavelength range from 1550 nm until 1552.4 nm, and spectral width is determined equal to 0.8 nm for each chirp. This system was encoded by three different kind of line coding, Non Return to Zero (NRZ), Return to Zero (RZ) and Carrier-Suppressed Return to Zero (CSRZ). The performance of the proposed system was evaluated in terms of BER of various distances. Based on the obtained results, in every weather condition, NRZ becomes the best modulation by outperforming other modulation techniques while CSRZ become the worst modulation by only being able to transmit the data in the shortest distance.

15:00 *Development of Android-based Apps for Last Mile Route Tracking in Courier Service*

Alias Mohd (UTM, Malaysia); Rozeha A. Rashid and Abdul Hadi Fikri Abdul Hamid (Universiti Teknologi Malaysia, Malaysia); Mohd Adib Sarijari (Universiti Teknologi Malaysia & Delft University of Technology, Malaysia); Mohd. Rozaini Abd. Rahim(Universiti Teknologi Malaysia, Malaysia)

E-commerce has grown exponentially over the years. The growth has been characterized by strong consumer demands and the increasing number of various products available online. This in turn creates a logistical problem and a high demand for efficient courier service to support the growing markets. It is very important for courier service provider that the delivery of the parcel is being done as fast as possible. One of the courier service's vital and most crucial business process is in the last mile parcel delivery. This is where an efficient delivery service will be of utmost importance. An efficient system needs to be developed in order to facilitate the interaction between the courier service provider and consumer to precisely determine the optimal route for the parcel delivery. In this paper, an Android-based application system for last mile route tracking in courier service is developed. It is a mobile application that eases the courier delivery personnel in finding their way to deliver the parcels to the customer's doorstep. The application will guide the courier personnel to get a list of courier data such as address and contact information and then navigate them to the selected customers' addresses based on traffic data retrieved from Google Maps API. It will choose the best route to the address and notify the customers before arriving so that the customers are ready to receive the parcel. This last mile route tracking for parcel delivery will provide the basis for an efficient courier service system.

CME 3

Control and Mechatronic Engineering 3
Room 6

14:00 *Velocity Control of a Two-Wheeled Inverted Pendulum Mobile Robot a Fuzzy Model-Based Approach*

Salinda Buyamin and Mustapha Muhammad (Universiti Teknologi Malaysia, Malaysia); Amir A. Bature (Bayero University Kano, Nigeria); Anita Ahmad (University of Technology Malaysia, Malaysia)

This paper presents the design of a fuzzy tracking controller for balancing and velocity control of a Two-Wheeled Inverted Pendulum (TWIP) mobile robot based on its Takagi-Sugino (T-S) fuzzy model, fuzzy Lyapunov function and non-parallel distributed compensation (non-PDC) control law. The T-S fuzzy model of the TWIP mobile robot was developed from its nonlinear dynamical equations of motion. Stabilization conditions in form of linear matrix inequalities (LMIs) were derived based on the T-S fuzzy model of the TWIP mobile robot, a fuzzy Lyapunov function and a non-PDC control law. Based the derived stabilization conditions and the T-S fuzzy model of the TWIP mobile robot, a state feedback velocity tracking controller was then proposed for the TWIP mobile robot. The balancing and velocity tracking performance of the proposed controller was investigated via simulations. The simulation result shows the effectiveness of the proposed control scheme.

14:20 *Sliding Mode Control for Altitude and Attitude Stabilization of Quadrotor UAV with External Disturbance*

Aminurrashid Noordin (Universiti Teknikal Malaysia Melaka, Malaysia); Mohd Ariffanan Mohd Basri and Zaharuddin Mohamed (Universiti Teknologi Malaysia, Malaysia)

This paper addresses the problem of robust altitude and attitude control of '×' mode configuration quadrotor UAV using a sliding mode control with saturation function. The dynamic model of the quadrotor is derived by considering nonlinearity factor. The dynamic model is simulated in MATLAB Simulink without and with the presence of external disturbance to test the robustness of the control method. The sliding mode controller is designed based on Lyapunov stability. The result shows the sliding mode controller provides good performance and robustness against disturbance.

14:40 *Detection of Foreign Objects in Milk Using an Ultrasonic System*

Sallehuddin Ibrahim (Universiti Teknologi Malaysia, Malaysia); Mohd Amri Bin Md Yunus (Faculty of Electrical Engineering & Universiti Teknologi Malaysia, Malaysia); Mohd Taufiq Md Khairi and Ahmad Ridhwan Wahap (Universiti Teknologi Malaysia, Malaysia)

This paper presents the application of an ultrasonic sensing system to detect foreign objects in milk. The advantage of an ultrasonic system is that it is low cost and it can detect a wide range of materials. A foreign body is any contaminated object found in food. Because of the scale of multifarious food processing levels and distribution, the utilization of the food product are sometimes difficult to control, which will inevitably lead to some complaints by consumers. Milk is widely consumed in the world as it is considered as a healthy drink due to it is high nutrients levels. However, from time to time cases of milk contamination are reported. In this project. the relationship between the foreign bodies in terms of their dimensions and the resultant amplitude were investigated. Mathematical modelling were carried out based on two ultrasonic parameters i.e. acoustic impedance and wave amplitude utilizing several types of foreign bodies with different dimensions. Three types of foreign bodies which are steel, rubber and air were investigated to determine the voltage amplitude detected by the ultrasonic receiver when the foreign bodies obstructed the ultrasonic wave propagation path. The diameters of foreign bodies were in the range from 4 mm to 11 mm. The results showed good correlations between the receiver voltage and the size of foreign bodies with correlation coefficients greater than 0.95. Each foreign body also demonstrated different voltage amplitudes when several sizes of the foreign bodies were tested which showed the ability of the system to distinguish the size of each foreign body

15:00 *Solenoid Actuated Five-Fingered Robotic Hand Design: Evaluating the Capability of Solenoid Actuators in Generating Basic Finger Motions*

Syed Zainal Abidin Syed Kamarul Bahrin and Khairul Salleh Mohamed Sahari (Universiti Tenaga Nasional, Malaysia)

There are numerous robotic hand designs but the five-fingered robotic hand design is the most dexterous robotic hand design due to its similar appearance and motions with the human hands. The fingers' motions are commonly driven by geared motors or other types of emerging technologies. However, the motions are yet to be driven directly by solenoid actuators due to its limited stroke length and also general perceptions of its applications as an actuator. Nevertheless, solenoid actuators are known for their fast reaction time and strong holding force which are useful to generate fast motions and strong grasping actions. To realise this concept, previous research and developments had been done by the authors but the outcome was not convincing enough due to the absence of a working prototype. Therefore, this paper introduced a new solenoid actuated robotic hand design and its prototype. The prototype was then tested and evaluated in accordance to the operational concept where the findings showed that the solenoid actuators were capable of generating basic finger motions.

ECE 5

Electronic and Computer Engineering 5
Room 5

14:00 *A Low Cost Experimental Assesment of Soil Macronutrient Spectroscopy Utilizing Raspberry-Pi Imaging Module*

Suhaila Isahak, Yusmeeraz Yusof and Mu Wen Chuan (Universiti Teknologi Malaysia, Malaysia); Nor Hafizah Ngajikin (Universiti Tun Hussein Onn Malaysia, Malaysia); Norhafizah Ramli (Universiti Teknologi Malaysia, Malaysia)

Soil spectroscopy measurement is widely used to determine the macronutrients content in the soil. Spectrometer is an expensive equipment which is commonly used to determine the transmittance, absorbance or reflectance level of various liquids and opaque solids by measuring the intensity of light as a light source passes through a sample chemical substance. This paper is reported on a low cost experimental assessment of soil macronutrient for soil spectroscopy utilizing raspberry-pi module in visible and near-infrared wavelength. The sensitivity measurements are mainly due to the concentration level and the intensity of LED light source. The work is focusing on the absorbance spectroscopy particularly on linear relationship to determine the N, P and K content level in soil using colour-developing reagent. The development of low cost and portable Raspberry-Pi based spectrophotometer has created new possibilities to measure the concentration level of the existed soil macronutrient within visible and infrared light wavelength of light sources. The absorbance of light was computed based on Beer-Lambert Law. The low cost Raspberry-Pi based spectrometer costs 80% less than the spectrometer available in the market and is capable of recording the absorbance measurements up to 5 samples. The

performance of this prototype shows that it is possible to build the spectrometer using open-source software and hardware by considering the limiting factors such as light transfer to the sample, spectral filtering and the sensitivity due to the signal-to-noise.

14:20 *Performance Analysis of Ultrathin Junctionless Double Gate Vertical MOSFETs*

Fauziyah Salehuddin (Universiti Teknikal Malaysia Melaka, Malaysia); Zul Atfyi Fauzan Mohammed Napiah (Universiti Teknikal Malaysia Melaka (UTeM) & Centre for Telecommunication Research & Innovation (CeTRI), Malaysia); Khairil Ezwan Kaharudin, Ameer Farhan Roslan and Anis Suhaila Mohd Zain (Universiti Teknikal Malaysia Melaka, Malaysia)

The main challenge in MOSFET minituarization is to form an ultra-shallow source/drain (S/D) junctions with high doping concentration gradient, which requires an intricate S/D and channel engineering. Junctionless MOSFET configuration is an alternative solution for this issue as the junction and doping gradients is totally eliminated. A process simulation has been developed to investigate the impact of junctionless configuration on the double-gate vertical MOSFET. The result proves that the performance of junctionless double-gate vertical MOSFETs (JLDGVM) are superior than the conventional junction double-gate vertical MOSFETs (JDGVM). The results reveal that the drain current (ID) of the n-JLVDGM and p-JLVDGM could be tremendously enhanced by 57% and 60% respectively as the junctionless configuration was applied to the double-gate vertical MOSFET. In addition, junctionless devices also exhibit larger ION/IOFF ratio and smaller subthreshold slope compared to the junction devices, implying that the junctionless devices have better power consumption and faster switching capability.

14:40 *Performance Analysis Comparison Between Non Mixed-Criticality and Mixed-Criticality System in Microcontroller*

Siti Maidin and Noor Azurati Ahmad (Universiti Teknologi Malaysia, Malaysia); Sharizal Fadlie Sabri (National Space Agency of Malaysia (ANGKASA), Malaysia); Salwani Mohd. Daud (Universiti Teknologi Malaysia & UTM Kuala Lumpur, Malaysia); Kamilia Kamardin and Yusnaidi Md Yusof (Universiti Teknologi Malaysia, Malaysia)

Implementation of real-time embedded system or safety-critical in real-time system is significant within emerging technologies nowadays because the system involve many aspects such as safety and task execution without missed deadlines. The main cause of the implementation is to avoid catastrophic loss. Besides, effectuation of mixed-criticality system in embedded system making system more complex for task execution. For embedded system, the main component involve is real-time scheduling. The implementation of DPM method in real-time scheduling is well known, but in mixed-criticality system, DPM method still lacking. In order to cater this problem, Dynamic Power management (DPM) method is deploy onto the microcontroller of mixedcriticality system to save energy when executing task in order to have better performance in the system. The usage of DPM method in mixed-criticality of microcontroller resulting decrease of 0.82% in LED output voltage value meanwhile for the LCD output, the voltage value decrease by 1.37% in home alarm system. Thus, the energy-saving in the microcontroller of mixedcriticality system using the DPM method is defined.

15:00 *Automated Library Booktruck for Traditional Libraries*

Jan Spies, JJ (Tshwane University of Technology, South Africa); Benjamin Kotze (Central University of Technology, Free State, South Africa)

The prompt shelving of returned library books is an important task in any traditional library. To help speed up the shelving process, this paper proposes an automated booktruck capable of moving returned library books from the return desk back to the shelves. Simulation data suggests shelving time, and therefore the dead time of returned books can be reduced by a significant factor

EPE 3

Electric Power Engineering 3

14:00 *Single Phase Multilevel Inverter Topology with Asymmetrical DC Sources and Reduced Number of Semiconductor Switches Operating at High Switching Frequency*

Saifullah Kakar (University of Technology, Malaysia); Shahrin Md. Ayob, Norjulia Mohamad Nordin and M Saad Bin Arif (Universiti Teknologi Malaysia, Malaysia)

In this paper, new fundamental block for asymmetrical multilevel inverter topology (MLI) is suggested with the objective of using decreased number of semiconductor switches, dc voltage sources, gate driver circuits and dc links. The structure of presented MLI is very simple, modular and less complex. Reduction of semiconductor switching devices, gate drivers and voltage sources significantly reduces cost, size and control complexity of the MLI system.The fundamental module of this structure consists of nine semiconductor switches (eight unidirectional and one bidirectional) and four DC sources. The basic module can be for used asymmetrical voltage source configuration by using different ratios of voltage sources. Increased number of voltage levels with reduced blocking voltage can be achieved by cascading the fundamental modules .Simulations for asymmetric voltage source configuration have been carried out for thirteen voltage levels using computer software tool Matlab/Simulink. The presented topology is also compared with traditional MLIs and other recently introduced MLIs to show its predominance in using less component count and total voltage blocking capability.

14:20 *Comparison on Space Charge and Voltage Distribution of High Voltage Insulator Subjected to Different Contamination Levels*

Nordiana Azlin Othman (Faculty of Electrical and Electronic Engineering, Universiti Tun Hussein Onn Malaysia, Malaysia); Nurul Samuri (UTHM, Malaysia); M. Afendi M. Piah (Universiti Teknologi Malaysia & Institute of High Voltage and High Current, Malaysia); Nor Akmal Mohd Jamail and Hanan Rosli (Faculty of Electrical and Electronic Engineering, Universiti Tun Hussein Onn Malaysia, Malaysia)

This paper presents the study of space charge distribution on high voltage (HV) insulators under different levels of contamination. Two types of HV insulators were used in this work particularly glass and porcelain insulators. A string of 4-unit glass and porcelain insulators with 33 kV of lines voltage was designed and simulated using QuickField software. Four levels of contamination layer with different thickness have been applied on the surface of insulators to observe the effect of space charge distribution. Simulation results show that different types of insulators used at transmission lines give different effects on charge and voltage distribution. It is also found that the amplitude of charge for a single porcelain insulator is much higher compared to a single glass insulator. Similarly for a string of 4-unit insulators, the voltage distribution along the creepage distance of porcelain insulators is much higher compared to glass insulators under all contamination levels.

14:40 *A Study of Cascaded H-Bridge Converter and Modular Multilevel Converter as a Recuperating Converter in DC Railway Electrification System*

Chuen Ling Toh, Zhen Hang Choi and Muhammad Hairi Zainol Hilmi (Universiti Tenaga Nasional, Malaysia)

The regenerative braking energy produced by Light-Rail-Transit (LRT) train is commonly transferred back to power grid via a conventional three-phase inverter (recuperating converter). Although this is a cost saving solution but the ac grid current and voltage waveforms were distorted. Hence passive filters are integrated to mitigate the harmonics. This paper proposed to replace the conventional inverter system with a multilevel converter. Cascaded H-Bridge (CHB) converter and Modular Multilevel Converter (MMC) are selected to be evaluated in this paper due to their modularity structures. The aim of this study is to determine the most potential multilevel converter to be implemented without additional passive filters. Nine-level CHB and nine-level MMC converters are modeled with MATLAB/Simulink simulation tool. Both converters are modulated with Level-Shifted Pulse Width Modulation technique. The output voltage and current waveforms generated by CHB and MMC are presented with full analysis. It is concluded that MMC converter is more suitable to use as a recuperating converter. It produces a clean voltage and current waveforms. The voltage and current Total Harmonic Distortion (THD) indexes are found approximate to 8% and 3%.

15:00 *Bridgeless PFC Single Ended Primary Inductance Converter (SEPIC) in Continuous Current Mode (CCM)*

Nor Akmal Rai, Mohd Junaidi Abd Aziz, Mohd Rodhi Sahid and Shahrin Md. Ayob (Universiti Teknologi Malaysia, Malaysia)

This paper presents bridgeless single ended primary inductor (SEPIC) converter operated in continuous conduction mode (CCM). The converter used in the study offers a lesser conduction loss compared to the other bridgeless SEPIC converter. In order to regulate the required output current and output voltage with high efficiency while achieving high power factor correction (PFC) at the input side, average current mode control is applied. The model is simulated using MATLAB/Simulink and it is found that the converter and the proposed control strategy provide a promising result. The preliminary results obtained from the experimental test-rig shows a good agreement as in simulation.

EPE 4

Electric Power Engineering 4
Room 4

14:00 *Surface Roughness Condition of Field-Aged High Voltage Polymer Insulators at Different Installation Area*

Asri Din (Universiti Teknikal Malaysia Melaka, Malaysia); M. Afendi M. Piah (Universiti Teknologi Malaysia & Institute of High Voltage and High Current, Malaysia); Abdul Rahim Abdullah (Universiti Teknikal Malaysia Melaka, Malaysia); Nur Faizal(Universiti Teknologi Malaysia, Malaysia)

This paper presents surface degradation assessment based on surface roughness condition for various field-aged high voltage polymer insulators that were installed at different locations. The measurement of arithmetical mean surface roughness is done, and statistical analysis is implemented in this study. Three groups of insulators labeled as 6 years, 12 years, 18 years, and with their respective controlled samples are tested using a surface roughness tester. Data measurements from the testing are analyzed in conjunction with visual observation to investigate an indication of surface degradation within the groups. Further statistical analysis is applied for the comparison of the surface roughness conditions. In order to observe the environmental stress factors that will affect the roughness condition, within the installation area, the virtual three-dimensional mapping program represented the Earth based on satellite imagery is utilized. The correlation analysis on all that three groups has indicated the positive outcomes with the roughness increased with respect to the age of insulator that located in quite similar environmental stress conditions. Regardless of the age of an insulator, the degradation due to surface roughness condition can be used to indicate what levels of environmental stress around the installation area have.

14:20 *Comparison of Lightning Return Stroke Channel-Base Current Models with Measured Lightning Current*

Chin-Leong Wooi (Universiti Malaysia Perlis, Malaysia); Zulkurnain Abdul-Malek (University Technology Malaysia, Malaysia); M. N. K. H. Rohani (University Malaysia Perlis & UNIMAP, Malaysia); Ahmad Muhyiddin Bin Yusof (Faculty of Engineering Technology, Universiti Malaysia Perlis (Unimap), Malaysia); Ali I Elgayar (UTM, University Technologi Malaysia, Malaysia & College of Electrical and Electronics Technology-Benghazi, Libya); Syahrun Nizam Md Arshad Hashim (Universiti Malaysia Perlis, Malaysia)

Electromagnetic pulse radiation produced around the lightning stroke channel has caused the disturbance to the microelectronic industry, especially to disturbance of high frequency to electronic systems. Lightning channel-base current function (CBC) characteristics and parameters determine lightning electromagnetic field (LEMF) results obtained on the basis of the used models. This paper evaluated and compared the measured lightning current and six lightning current-based channels models namely Bruce and Golde, Heidler, Diendorfer and Uman, Nucci, Pierce and Cianos and new current-based current (NCBC) models. In terms of the waveshape, among all the six lightning channel-based current models discussed, the models developed by Javor, Nucci and Diendorfer and Uman have showed a good agreement compared to the measured lightning current. In terms of 10-90% risetime and full width half maximum time (FWHM) comparison, NCBC and Nucci models have showed compatible comparison. However, Nucci model is not easily adjustable to different desired pulse-current waveshapes. On the other hand, NCBC model can be simplified, the values of lightning peak current and risetime can be chosen arbitrarily and independently from other parameters, and there is no need for the peak-correction factor, so that reduces the number of parameters. Therefore, the NCBC model was suggested to be used in the future in order to simulate much accurate return stroke model. This knowledge will contribute to the development of a new accurate and efficient return stroke model.

14:40 *AC Breakdown Behavior of SF6/N2 Gas Mixtures Under Non-Uniform Field Electrode Configurations*

Nur Farhani Ambo and Hidayat Zainuddin (Universiti Teknikal Malaysia Melaka, Malaysia); Muhammad Saufi Kamarudin (Universiti Tun Hussein Onn Malaysia, Malaysia); Jamaludin Mohd Wari (Indkom Engineering Sdn. Bhd, Malaysia); Ayuamira Zahari (Universiti Teknikal Malaysia Melaka, Malaysia)

Sulphur hexafluoride (SF6) gas owns remarkable properties as insulation medium and current interrupter, which make it being widely used in gas-insulated equipment up to now. However, SF6 gas has a drawback that gives adverse effect to the environment since it is a strong greenhouse gas. As the effort to minimize the SF6 usage, this study was conducted to investigate the AC breakdown behavior of SF6/N2 gas mixtures with 10/90 ratio at low pressure levels (i.e. 0.11 MPa to 0.15 MPa) under non uniform field (i.e. R0.5-plane and R6-plane electrodes configurations). The results of the study indicate that the breakdown voltage of SF6/N2 gas mixtures in non-uniform field increases linearly with the increase of gas pressure and electrodes gap distance. As a function of gap distance, a higher increasing rate of breakdown voltage values were achieved at lowest pressure of 0.11 MPa compared to other pressure levels. In addition, it is also found that a higher breakdown voltage values was obtained under R6-plane configuration. But, the difference in breakdown voltage values between R0.5-plane and R6-plane configuration is less significant as the gap distance is increased. It is also observed that the field efficiency factor of R6-plane is higher than R0.5-plane which indicates a more uniform field exists between the electrodes.

15:00 *Electromagnetic Pollution near by Warehouse Caused by Power Transmission Lines by Considering the Soil Resistivity*

Ali I Elgayar (UTM, University Technologi Malaysia, Malaysia & College of Electrical and Electronics Technology-Benghazi, Libya); Zulkurnain Abdul-Malek and Mohammed Imran Mousa (University Technology Malaysia, Malaysia); Visa Musa Ibrahim (FKE UTM JOHOR BAHRU, Malaysia); Chin-Leong Wooi (Universiti Malaysia Perlis, Malaysia); Ruqayyah Othman (Universiti Teknologi Malaysia & Faculty of Electrical Engineering, Malaysia); Ibtihal F Elshami (College of Electrical and Electronics Technology-Benghazi-Libya & Universiti Teknologi Malaysia UTM, Malaysia)

The Alternating Current (AC) total interference of power lines may pose a threat to personnel and equipment in vicinity, was studied. The main objective of this work is to determine the electromagnetic distribution and induced voltages on human body, equipment, and houses due to the AC total interference at different soil resistivity which causes health problems to the human body and puts it at risk. Two main approaches were used to compute the electromagnetic and induced voltages, namely the field approach, which is based on electromagnetic field distribution, and the circuit approach, which uses the circuit grounding analysis to compute the conductive interference and the circuit based models to compute the inductive interference. Human body, steel houses and 10km-long transmission line were modelled. The soil resistivity was varied, and the induced voltages obtained from both approaches were compared. Soil resistivity and soil structure are important parameters that affect the AC interference level. The results show that the touch voltages increased when the distance between electromagnetic source and human body increase. For high soil resistivity the touch voltage become more dinger compare to low soil resistivity. The level power system and soil resistivity affected the amount of induced voltages.

Thursday, November 29 15:40 - 16:00

Afternoon Break

Thursday, November 29 16:00 - 17:40

CE 7

Communication Engineering 7
Room: Room1

16:00 ***Measuring the Underwater Received Power Behavior for 433 MHz Radio Frequency Based on Different Distance and Depth for the Development of an Underwater Wireless Sensor Network (UWSN)***

Muhammad Ramdhan Mohd Suhaili, Kamaludin Mohamad Yusof and Muhammad Ali (Universiti Teknologi Malaysia, Malaysia); Nurzal Effiyana Ghazali (Universiti Teknologi Malaysia & Universiti Teknologi Malaysia, Malaysia); Samura Ali(Universiti Teknologi Malaysia, Malaysia)

Underwater wireless sensor network (UWSN) important to enhance the widely use of the application of the Internet of things (IoT) for underwater. Uses of acoustics base of wave propagations are the best ways to establish the UWSN. But the practicality of the hardware due to the size and cost has limited the application of UWSN. Radio frequency (RF) wave propagation is the best way to overcome this situation. Low frequency of the RF wave is proven feasible and suitable for underwater communication. 433 MHz RF were chosen to measuring the underwater received power behavior between the transmitter node and receiver node based on different distance and depth. 433 MHz transceiver module was used as a transmitter and spectrum analyzer with the telescopic antenna was used as a receiver. The received power give a good reading when the transmitter note was at 0.5-meter depth with a maximum operating range within 12 meters from the receiver.

16:20 ***The Dynamics of Traffic Congestion: A Specific Look into Malaysian Scenario and the Plausible Solutions to Eradicate It Using Machine Learning***

Muhammad Ali, Kamaludin Mohamad Yusof, Tee Kok Sheng and Muhammad Ramdhan Mohd Suhaili (Universiti Teknologi Malaysia, Malaysia); Nurzal Effiyana Ghazali (Universiti Teknologi Malaysia & Universiti Teknologi Malaysia, Malaysia); Samura Ali (Universiti Teknologi Malaysia, Malaysia)

transportation has been considered as the backbone of economy for the past many years. Unfortunately, since few years due to the uncontrolled urbanization and inadequate planning, countries are facing problem of congestion. The congestion is hindering the economic growth and also causing environment issues. This has caused serious concerns among the major economies of the world, especially in Asia-Pacific region. Many countries are playing an active role in eradicating this problem and some have been quite successful so far. Malaysia, being a major ASEAN economy is also tackling with this huge problem. The authorities are committed to solve the issue. In this regard, solving the issue leveraging the use of big data analytics has become crucial. The authorities can form a complete robust framework based on big data analytics and decision making process to solve the issue effectively. The work observes the traffic data samples and analyzes the accuracy of machine learning algorithms, which helps in decision making. Yet, here is a lot to be done if the government needs to solve the problem effectively.

16:40 ***Indoor Positioning System Based on WLAN Fingerprint and User Orientations with Minimum Computation Time***

Firdaus Firdaus (Universitas Islam Indonesia, Indonesia); Noor Azurati Ahmad and Shamsul Sahibuddin (Universiti Teknologi Malaysia, Malaysia)

Indoor Positioning System (IPS) has an important role in the field of Internet of Thing. IPS works based on many existing radio frequencies technology. One of the most popular methods is WLAN Fingerprint because this technology has installed widely inside buildings and it provided a high level of accuracy. The performance is affected by people who hold mobile devices (user) and also people around the user. The aim of this research is to minimize the computation time of kNN searching process. The results showed that when the value of k in kNN is getting bigger, the computation time increases, especially when using cityblock and minkowski distance function. The smallest average computation time is 2.14ms, when using cityblock. Then computational time for euclidean and chebychev are relatively stable, 2.2ms and 2.23ms.

17:00 ***Geometric Sensitivity and Trajectory of Airborne Mobile Anchors***

Izanoordina Ahmad (University Kuala Lumpur-British Malaysian Institute, Malaysia); Neil W Bergmann (University of Queensland, Australia); Raja Jurdak (CSIRO & University of Queensland, Australia); Branislav Kusy (Commonwealth Scientific and Industrial Research Organisation (CSIRO) ICT Centre, Australia)

Locating fixed sensing devices with a mobile anchor is attractive for covering larger deployment areas. However, the performance sensitivity to the geometric arrangement of anchor beacon positions remains unexplored. Therefore, localization using new RSSI-based localization algorithm, which uses a volumetric probability distribution function is proposed to find the most likely position of a node by information fusion from several mobile beacon radio packets to reduce error over deterministic approaches. This paper presents the guidelines of beacon selection that leads to design the most suitable trajectory, as a trade-off between the energy costs of travelling and transmitting the beacons versus the localization accuracy.

CE 8

Communication Engineering 8
Room: Room2

16:00 *A 28 GHz 0.18 Um CMOS Cascade Power Amplifier with Reverse Body Bias Technique*

Ahmad Fariz Hasan (Universiti Malaysia Perlis & UNIMAP, Malaysia); Sohiful Anuar Bin Zainol Murad and Faizah Abu Bakar (Universiti Malaysia Perlis, Malaysia)

A 28 GHz power amplifier (PA) using CMOS 0.18 µm Silterra process technology is reported. The cascade configuration has been adopted to obtain high Power Added Efficiency (PAE). To achieve low power consumption, the input stage adopts reverse body bias technique. The simulation results show that the proposed PA consumes 31.09 mW and power gain (S21) of 9.51 dB is achieved at 28 GHz. The PA achieves saturated power (Psat) of 11.10 dBm and maximum PAE of 16.55% with output 1-dB compression point (OP1dB) 8.44 dBm. These results demonstrate the proposed power amplifier architecture is very suitable for 5G applications.

16:20 *Entire X-band Region Metamaterial Absorber and Reflector with a Microstrip Patch Switch for X-band Applications*

mohammed mustapha gajibo, Noor Asniza Murad and Osman Bin Ayop (Universiti Teknologi Malaysia, Malaysia); Huda A. Majid (Universiti Tun Hussein Onn Malaysia, Malaysia); Murtala Aminu (UTM, Nigeria); Raimi Dewan (Universiti Teknologi Malaysia, Malaysia)

A metamaterial structure capable of operating as a wide band absorber as well as an AMC reflector is presented in this report. A microstrip patch copper was used as a switch to switch between the two modes. An FR4 substrate was used and the incidental wave angles were varied from 0 to 60 degrees. Simulations results showed that the absorber was able achieve 96% absorption at 13.05 GHz and 100% absorption at 10.00 GHz and 12.00 GHz. Furthermore it archived over 85% absorption for the entire X-band frequency range. The AMC reflector also was able to achieve 84.97%, 82.88% and 78.69% for incident angles 0, 20 and 40 degrees respectively. Unfortunately, the structure is polarization sensitive.

16:40 *Floral Structure for Textile-based Metamaterial Absorber*

Siti Nurzulaiha Isa and Osman Bin Ayop (Universiti Teknologi Malaysia, Malaysia); Farid Zubir (Universiti Teknologi Malaysia & Faculty of Electrical Engineering, Malaysia); Noor Asniza Murad and Mohamad Kamal A Rahim (Universiti Teknologi Malaysia, Malaysia)

Based on an annulled circle structure metamaterial absorber (MMAb), a floral structure MMAb design is proposed for its improved performance in absorptivity. Since the initial purpose of designing the MMAb is for hiding one's existence from electromagnetic motion detector, it is expected that the MMAb will have flexibility as one of its characteristics. The MMAb composes of textile-based substrate in between floral structure at the top and ground plane at the bottom, based on metallic plate. The targeted center frequency is 10.525GHz and through series of simulation done in CST Microwave Software, the MMAb can reach up to 97.03% of absorptivity. The operating angle can be extended at least 68o before its absorptivity deteriorated below 80%. In addition, the proposed MMAb has a high absorptivity regardless of the polarization angle of the electromagnetic waves.

17:00 *Circular Polarization Folded Reflectarray Antenna for 5G Applications*

Mohd Fairus Mohd Yusof (Faculty of Electrical Engineering, Universiti Teknologi Malaysia, Malaysia); Lim Jit Min, Mohamad Rijal Hamid and Zaharah Johari (Universiti Teknologi Malaysia, Malaysia)

Fifth-generation (5G) is a wireless connection built specifically to keep up with the rapid increase of devices that need a mobile internet connection. A system working on 5G band can provide higher bandwidth and faster data rate as compared to fourth-generation (4G) band. Thus, an antenna with higher gain and lower profile is required to support this system. On the other hand, the performance of circular polarization antenna is better than linear polarization antenna due to its ability to accept wave from different direction. In this project, a low profile circular polarization folded reflectarray antenna with operating frequency of 28 GHz is presented. This project is divided into two parts. In the first part, a linear polarization folded reflectarray antenna is designed. In this second part, a meander lines polarizer is used to convert the linear polarization antenna to circular polarization antenna. The antenna is fed by a linear polarized waveguide. Each radiating element of the antenna is in rectangular shape. The size of the radiating elements are selected according to obtain required phase delay to form a planar phase front in the far-field distance. Both of the antennas are simulated by using Computer Simulation Technology (CST) software. Finally, the results shows excellent performances with 16.81dB directivity and 1.49dB axial ratio at 28GHz. Thus, the antenna is mostly suitable for 5G applications.

CE 9

Communication Engineering 9
Room 7

16:00 *Wide to Multiband Elliptical Monopole Reconfigurable Antenna for Multimode Systems Applications*

Izni Husna Idris, Mohamad Rijal Hamid, Kamilia Kamardin and Mohamad Kamal A. Rahim (Universiti Teknologi Malaysia, Malaysia)

Wideband-multiband reconfigurable elliptical monopole antenna is investigated in this paper. By having conventional elliptical monopole antenna, wideband operating frequency is obtained. With the combination of dual pairs of slotted arms and a band-pass filter on the ground plane of the elliptical monopole, multiband is achieved. Dual-band operating frequencies at 1.6 GHz and 2.6 GHz while wideband operates from 3.35 GHz to 9 GHz. Therefore, wide range of wireless communication systems is obtained from the proposed antenna to support the multiband mode (i.e. GPS and LTE) and UWB systems. Frequency reconfigurable is achieved by controlling the switches integrated on the antenna structure. Simulated results of reflection coefficient, radiation patterns and gain performance are presented. The proposed antenna design is suitable candidate for different wireless communication applications.

16:20 *Fractal Yagi-Uda Antenna for WLAN Applications*

Amerrul Zabri (Universiti Teknologi Malaysia & Universiti Teknologi Malaysia, Malaysia); Mohamad Kamal A. Rahim (Universiti Teknologi Malaysia, Malaysia); Norsaidah Muhamad Nadzir (Universiti Teknologi Malaysia & Universiti Teknologi Malaysia, Malaysia); Huda A. Majid (Universiti Tun Hussein Onn Malaysia, Malaysia); Farid Zubir (Universiti Teknologi Malaysia & Faculty of Electrical Engineering, Malaysia)

This paper describes the development of a Fractal printed Yagi-Uda antenna for WLAN applications operating at 2.4 GHz frequency. In miniaturizing the dimensions of an antenna, fractal method is applied where the 1st iteration and 2nd iteration is implemented. The antenna is designed and simulated using Computer Simulation Technology (CST) software. The substrate material used is the FR-4 board which has a dielectric constant of 5.4, the thickness of 1.6mm and tangent loss of 0.019. The performance of the antenna in term of reflection coefficient, radiation pattern and gain are compared and analyzed. For the 1st iteration, 22.81% of reduction size has been achieved and 30.81% reduction of the antenna size for 2nd iteration has been achieved.

16:40 *26 GHz Phase Shifters for Multi-Beam Nolen Matrix Towards Fifth Generation (5G) Technology*

Norhudah Seman, Nazleen Syahira Mohd Suhaimi and Tien Han Chua (Universiti Teknologi Malaysia, Malaysia)

This paper presents the designs of phase shifters for multi-beam Nolen matrix towards the fifth generation (5G) technology at 26 GHz. The low-cost, lightweight and compact size 0° and 45° loaded stubs and chamfered 90°, 135° and 180° Schiffman phase shifters are proposed at 26 GHz. An edge at a corner of the 50 Ω microstrip line Schiffman phase shifter is chamfered to reduce the excess capacitance and unwanted reflection. However, the Schiffman phase shifter topology is not relevant to be applied for the phase shifter less than 45° as it needs very small arc bending at 26 GHz. The stubs are loaded to the phase shifter in order to obtain electrical lengths, which are less than 45°. The proposed phase shifters provide return loss better than 10 dB, insertion loss of -0.97 dB and phase difference imbalance of ± 4.04° between 25.75 GHz and 26.25 GHz. The Rogers RT/duroid 5880 substrate with dielectric constant of 2.2 and substrate thickness of 0.254 mm is implemented in the designs.

CME 3

Control and Mechatronic Engineering 3
Room 6

16:00 *Advancement of a Smart Fibrous Capillary Irrigation Management System with an Internet of Things Integration*

Muhammad Khairie Idham Abd Rahman (Universiti Teknologi Malaysia, Malaysia); Mohamad Shukri Zainal Abidin (University of Technology Malaysia, Malaysia); Mohd Saiful Azimi Mahmud and Salinda Buyamin (Universiti Teknologi Malaysia, Malaysia); Mohamad Hafis Izran Ishak (Fakulti Kejuruteraan Elektrik, Universiti Teknologi Malaysia, Malaysia); Abiodun E Abioye (Universiti Teknologi, Malaysia)

This paper presents the development work for integrating an Internet of Things (IoT) with a fibrous capillary irrigation system that was based upon the climatic demand as estimated by a weather station. The monitoring and the control of using an IoT system became critical for such an application that was targeted at precision irrigation. The fibrous capillary irrigation system was managed by manipulating a water supply depth when using potential evapotranspiration (ETo) data, in order to estimate the crop water demands. A soil moisture sensor was used to monitor the progress of the root water uptake and to assist the fuzzy logic system, so as to determine the water requirements for the crop medium. An experiment was conducted by using a Choy Sam plant as the test crop when it was grown in a greenhouse. The monitoring of the demand that was based upon the watering system was successful and the ETo data was able to approximate the crop water requirements in near real time.

16:20 *Electronics System Thermal Management Optimization Using Finite Element and Nelder-Mead Method*

Fatimah Sham Ismail and Nurul Kausar Ab Majid (Universiti Teknologi Malaysia, Malaysia)

The demand for high-performance, smaller-sized, and multi-functional electronic systems poses a great challenge to the thermal management issues in a printed circuit board (PCB) design. Moreover, this thermal problem can affect the lifespan, performance, and the reliability of the electronic system. This project presents the simulation of an optimal thermal distribution for various samples of electronics components arrangement on PCB. The objectives are to find the optimum components arrangement with minimal heat dissipation and cover small PCB area. Nelder-Mead Optimization (NMO) with Finite Element methods have been used to solve these multi-objective problems. The results show that with the proper arrangement of electronics components, the area of PCB has been reduced by 26% while the temperature of components is able to reduce up to 40%. Therefore, this study significantly benefits for the case of thermal management and performance improvement onto the electronic product and system.

16:40 *Development of a Remote Tending System for Analog Broadcast Transmitters*

Gerino P Mappatao (De La Salle University, Philippines)

Whenever a broadcast transmitter is on-air, it is required to be tended by licensed broadcast technicians. Technicians periodically monitor the transmitter performance, record the supply voltage and current at the last stage of the power amplifier and keeps a copy for at least two years. Also recorded are the times the transmitter is turned ON and OFF as well as the times the transmitter shuts down and returns back to air. This paper proposes a system to remotely tend analog transmitters in one central monitoring station. The remote tending of several transmitters in one location is made possible through internet connection. However, the challenge in the proposed system is in the gathering of transmitter data. A prototype of the system was constructed and tested in an FM broadcast transmitter. Test results on the prototype performance show that the proposed system is able to remotely monitor, record data and control the status of analog broadcast transmitters. The primary feature of the proposed system of monitoring several transmitters in one location will bring cost effective advantages to the broadcast operators.

17:00 *Modeling and Simulation of a Wirelessly-Powered Thermopneumatic Micropump for Drug Delivery Applications*

Marwan Nafea (Universiti Teknologi Malaysia (UTM), Malaysia); Jeevananthan Baliah (Jabil Circuit, Malaysia); Mohamed Sultan Mohamed Ali (Universiti Teknologi Malaysia & UTM, Malaysia)

This paper presents modeling and simulation of a thermopneumatic micropump with a novel design that does not affect the temperature of the working fluid. The micropump is operated by activating a passive wireless heater using wireless power transfer when the external magnetic field is tuned to the resonant frequency of the heater. The heater is responsible for heating an air-heating chamber that is connected to a loading reservoir through a microdiffuser element. The solution inside the reservoir is pumped through a microchannel that ends with an outlet hole. The performance of the micropump is analyzed using finite element method over a low range of Reynold's number < 10 that is suitable for various biomedical applications. The simulated operation of the device demonstrated promising performance results with a maximum flow rate of ~2.86 µL/min at a chamber temperature of 42.5 °C, and a maximum pumping pressure of 406.5 Pa. The results show that the developed device can be potentially implemented in various biomedical areas, such as implantable drug delivery applications.

ECE 5

Electronic and Computer Engineering 5
Room 5

16:00 *High Power Supply Rejection Ratio (PSRR) at High Frequency Low Dropout Regulator*

Astrie Nurasyeila Fifie Asli (Micro and Nano Electronic (MiNE) Research Group, UTeM, Malaysia); Yan Chiew Wong (Universiti Teknikal Malaysia Melaka, Malaysia)

A low dropout (LDO) voltage regulator with high power supply rejection ratio (PSRR) and low temperature coefficient is presented in this paper. Large 1µF off-chip load capacitor is used to achieve the high PSRR LDO. However, this decreases the gain and pushes the LDO's output pole to lower frequency causing the circuit to be unstable. The proposed LDO uses rail-to-rail folded cascode amplifier to compensate the gain and stability problems and to achieve 2nd order curvature voltage-temperature behavior in order to reduce the temperature coefficient. The LDO is designed using 0.18µm CMOS technology and achieves a constant 1.8V output voltage for input voltages from 3.2V to 5V and load current up to a 128mA at temperature between -40°C to 125°C. The proposed LDO is targeted for RF application which has stringent requirement on noise rejection over a broad range of frequency.

16:20 *High Voltage Conversion Differential-drive Rectifier for RF Energy Harvesting System*

Astrie Nurasyeila Fifie Asli (Micro and Nano Electronic (MiNE) Research Group, UTeM, Malaysia); Yan Chiew Wong (Universiti Teknikal Malaysia Melaka, Malaysia)

This paper presents a high voltage conversion at high sensitivity RF energy harvesting system for IoT applications. The harvesting system comprises of bulk-to-source BTMOS differential-drive based rectifier to produce a high efficiency RF energy harvesting system. Low-pass upward matching network is applied at the rectifier input to increase the sensitivity and output voltage. Dual-gate-thickness transistor is used in the rectifier circuit to maintain the power efficiency at each stage of the rectifier. The system is designed using 0.18µm Silterra RF in deep n-well process technology and achieves 4.07V output at -16dBm sensitivity without the need of complex auxiliary control circuit and DC-DC charge-pump circuit.

16:40 *Noise and PSRR Design Consideration in Low Dropout LDO Voltage Regulator for Energy Harvesting Power Management Unit*

Mohamad Khairul Mohd Kamel and Yan Chiew Wong (Universiti Teknikal Malaysia Melaka, Malaysia)

Harvesting energy from ambient RF source is a great deal toward batteryless IoT SoCs application as green technology has become a future interest. However, the harvested energy is unregulated thus it is highly susceptible to noise and cannot be used efficiently. Therefore, a dedicated low noise and high PSRR of low dropout LDO voltage regulator are needed in the later stages of system development to supply the desired load voltage. Detailed analysis of the noise and PSRR of an LDO is not sufficient. This work presents a design of LDO to generate a regulated output voltage of 1.8V from 3.3V input supply targeted for 120mA load application. The performance of LDO is evaluated and analyzed. The PSRR and noise in LDO have been investigated by applying a low-pass filter. The proposed design achieves the design specification through the simulation results by obtaining 90.85dB of open-loop gain, 76.39° of phase margin and 63.46dB of power supply ripple rejection (PSRR) respectively. The post-layout simulation shows degradation of gain and maximum load current due to parasitic issue. The measurement of maximum load regulation is dropped to 96mA compared 140mA from post-layout. The proposed LDO is designed using 180nm Silterra CMOS process technology.

17:00 *A 1.2V Miniature On-Chip Battery-less Power Management System*

Jim Hui Yap and Yan Chiew Wong (Universiti Teknikal Malaysia Melaka, Malaysia)

This paper presents a fully-integrated on chip battery-less power management system through energy harvesting circuit developed in a 130nm CMOS process. Complementary Metal-Oxide-Semiconductor (CMOS) voltage booster and a dynamic closed loop power management are designed and integrated to boost a 30mV input voltage from a TEG to a regulated 1.2V. Thermoelectric energy harvesting is applied to harvest waste body heat to power up low power devices such as Wireless Body Area Network. The proposed voltage booster operates in Discontinuous Conduction Mode (DCM) together with digitally control oscillator for the gate control. Radio Frequency (RF) rectifier is utilized to act as a start-up mechanism for voltage booster and power up the subsequent circuits in closed loop power management. The digitally control oscillator and comparator are able to operate at 600mV which is powered up by a RF rectifier, and thus to kick-start the voltage booster. The individual circuits form a dynamic closed loop power management regulates the output voltage of the voltage booster at 1.2V and will not drop beyond 1.15V in the system. The battery-less power management system manages to operate as low as 30mV to 1.2V. 1 Degree Celsius thermal difference produces a minimum 30mV is utilized to an useful electricity.

EPE 3

Electric Power Engineering 3
Room 3

16:00 *Breakdown Characteristics of Polyethylene/Silicon Nitride Nanocomposites*

Aizat Azmi (Universiti Teknlogi Malaysia, Malaysia); Kwan Yiew Lau (Universiti Teknologi Malaysia, Malaysia); Khairull Amrey Abu Seman (Jabatan Kerja Raya Malaysia & Universiti Teknologi Malaysia, Malaysia)

Silicon nitride (Si3N4) has been utilized as a nanofiller in polymeric insulation due to its good characteristics in both electrical insulation and thermal conduction properties. In this work, a comparative study was performed between unfilled polyethylene and polyethylene containing different amounts of Si3N4 nanofiller. The study showed that the low density polyethylene (LDPE) added with 15 wt% of Si3N4 nanofiller could have higher breakdown strength compared to equivalent LDPE with 10 wt% of Si3N4 nanofiller. Morphological characterizations of the nanocomposite samples were performed using field emission electron microscopy (FESEM) and the results showed that the breakdown performance of the investigated materials were affected by the agglomeration of Si3N4 nanoparticles

16:20 *Space Charges Analysis on Cross-Linked Polyethylene (XLPE) Insulator with Effect of Uniform Layer Contamination*

Mohd Haris Asyraf Shee Kandar (Universiti Tun Hussein Onn Malaysia, Malaysia); Nor Akmal Mohd Jamail and Nordiana Azlin Othman (Faculty of Electrical and Electronic Engineering, Universiti Tun Hussein Onn Malaysia, Malaysia); Qamarul Ezani Kamarudin (Faculty of Mechanical and Manufacturing Engineering, UTHM, Malaysia); Nor Asiah Muhamad (Universiti Sains Malaysia, Malaysia)

High voltage direct current (HVDC) transmission provides an attractive alternative for bulk power transfer. However, HVDC transmission may have loss about half per unit length of HVAC at the same amount of power carried. This is due to the space charge formation around the conductor in HVDC cables. It is known that the presence of space charge inside an insulator may distort the local electric field and surface energy. This paper investigates the effect of electrostatics for space charge, electric field and surface energy in the HVDC cable in clean and contaminated conditions. The effect of uniform layer contamination from oil, sandstone and fresh water was conducted on 11 kV cross-linked polyethylene (XLPE) cable using finite element software under electrostatics study. The contamination layer was created around the XLPE cable by multifarious the radius of layer contamination from the conductor. The simulation results show that enlargement of contamination layer radius by 1.0mm (light), 1.5mm (medium) and 2.0mm (heavy) resulted in the reduction of surface energy by 20% and electric field by 22% but increase the space charge amplitude by 76%. The study also found that fresh water can be considered as the worst contamination compared to oil and sandstone.

16:40 *Minimizing Harmonic Distortion Impact Cause by Charging Station Using Meta Heuristic Technique*

Syed Norazizul Syed Nasir and Jasrul Jamani Jamian (Universiti Teknologi Malaysia, Malaysia); Wazir Mustafa (Faculty of Electrical Engineering, Universiti Teknologi, Malaysia)

Non-linear load in the distribution system has caused negative impact to its power quality especially on harmonic distortion. Charging Station (CS) is a non-linear load that widely promoted with the aim to support the continuous usage of Electric Vehicle (EV). This research is focusing on optimal placement and sizing of multiple passive filter to mitigate harmonic distortion due to CS usage at distribution system. There are 6 units of CS which being placed in low voltage buses which indirectly will inject harmonic to the system during charging. Power system harmonic flow, passive filter, CS, battery and the analysis will be model in MATLAB. Multi-objective function which are weight summation approach (WSA) and Pareto Front are used to assist meta heuristic technique which is Modified Lightning Search Algorithm (MLSA) to identify optimum location and sizing of passive filter based on improvement on propose five parameters. From the result, the optimal placements and sizing of passive filter able to reduce the maximum Total Harmonic Distortion (THD) for voltage, current and apparent losses respectively. Therefore, the propose method is suitable to reduce harmonic distortion as well as apparent losses at distribution system with present of CS.

17:00 *Factors That Affects the Dielectric Properties of Natural Fibre Reinforced Hybrid Composite*

Nishanthi Sunthrasakaran (Universiti Tun Hussein Onn Malaysia, Malaysia); Nor Akmal Mohd Jamail (Faculty of Electrical and Electronic Engineering, Universiti Tun Hussein Onn Malaysia, Malaysia); Rahisham Abd. Rahman (Universiti Tun Hussein Onn, Malaysia); Md Nor Ramdon Bin Baharom (Universiti Tun Hussein Onn Malaysia, Malaysia); Qamarul Ezani Kamarudin (Faculty of Mechanical and Manufacturing Engineering, UTHM, Malaysia); Mohamad Farid Sies and W. Muhammad W. N. Azrina (Universiti Tun Hussein Onn Malaysia, Malaysia)

Almost all research on natural fibre reinforced composite has focused on the mechanical properties of the composite. Drawing on the important factors that effect the end product of composite, this paper reviews electrical properties of hybrid composite when fibre content and surface treatment is carried out. The compilation of dielectric constant, dissipation factor, loss factor and moisture absorption reported by researchers has been presented in this paper. The intrinsic characteristic of natural fibre which is hydrophilic is the main drawback that affects the electrical properties of the composite. Alkaline treatment on natural fibre has proven to overcome the hydrophilic characteristic and improves the adhesion between matrix and fibre. Besides that, the percentage of fibre content plays an important role in producing a good natural fibre reinforced hybrid composite. The moisture uptake, dielectric constant, dissipation factor and loss factor of the composite decreases with decreased fibre content.

EPE 4

Electric Power Engineering 4
Room 4

16:00 *Computation of Current-Resistor Photovoltaic Model Using Reverse Triangular Number for Photovoltaic Emulator Application*

Razman Ayop, Chee Wei Tan and Kwan Yiew Lau (Universiti Teknologi Malaysia, Malaysia)

PV emulator (PVE) is a power supply that produces a similar current voltage (I V) characteristic as the PV module. It simplifies the testing of the PV system during the development phase. Since the output voltage and current of the PVE change based on various factors (load, irradiance and temperature), the computation of the operating point for the PVE is crucial. The resistance feedback control strategy is a robust and fast approach to find the operating point for the PVE. Nonetheless, it uses an uncommon current resistance PV model, which cannot be computed using the conventional approach. This paper proposed the reverse triangular number to compute the PV model and obtained the operating point of the PVE. The reverse triangular number is based on the variable step sizes that allow fast computation of the PV model. The operating point is then used by the PI controller and the buck converter to produce the output voltage and current similar to the PV module. The proposed reverse triangular number is able to compute the PV model accurately. While the proposed PVE is able to work with the resistive load and the MPPT boost converter using the P&O algorithm.

16:20 *High Performance Multi-Phase Permanent Magnet Synchronous Machine with Different Winding Configurations and Magnetization Patterns*

Dahaman Ishak (Universiti Sains Malaysia, Malaysia); Mohd Rezal (UniKL MSI, Malaysia)

Permanent Magnet Synchronous Machine (PMSM) is the most reliable and efficient machine that widely used in robotics and automation, industrial applications, electric vehicles, home appliances, aircraft and aerospace technology due to its high efficiency, good dynamic performance and high torque density. In this paper, the influence of various types of winding configuration and different magnetization patterns in the performance of a five-phase PMSM is investigated. Three types of magnetization patterns such as radial magnetization (RM), parallel magnetization (PaM), and multi-segmented Halbach magnetization (SH) are applied to the five-phase 10-slot/4-pole PMSM during open-circuit and on-load conditions. A 2D finite element method (FEM) is intensively used in this investigation to model and predict the electromagnetic characteristics and performance of the PMSM. The detailed results from the finite-element analysis (FEA) on the cogging torque, induced back-emf, airgap flux density and electromagnetic torque are analysed. The induced back-emf of the machine is computed further into its harmonic distortions. Additionally, the skewing method for minimization of cogging torque of PMSM is proposed. From the results, it is observed that the five-phase, 10-slot/4-pole PMSM with double layer distributed winding and parallel magnetization gives the best machine performance.

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